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## THE <br> TRICYCLISTS INDISPENSABLE ANNUAL

AND HANDBOOK, A Guide to the Pastime, and Complete Cyolopædia on the Subject, HENRS STURMES.
AOTHOR OF "THE COMPLETE GUIDE TO BICYCLING," "THE INDISFENSABLE BICYCLISTS" HANDBOOK," EDITOR OF "THI CYOLIST," SUB EDITOR OF "THE TMCXCLIST," ETC.

## THE

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## As ridden by A. Nixon, Esq. (see below).

(Dne II undred Miles in 9 Honrs 22 Minmies.-Mr. A. Nixon left Upper Norwood at $9 \mathrm{a} . \mathrm{m}$. on the 15 th , timed out by A. E. Woodhouse, L.T.C., to try to put on a "record" for 100 miles, and reached Brighton (Cyclist Club), 50 miles, at $1 \cdot 19$, where his time was checked. He stopped there until 135, during which time he lunched. He then started back, stopping five minates at Hand Cross for refreshment, and reached Crawley at 4 p.m. The next stoppage, was at Red Hill ( 4.55 to 5.5 ), where he was met by Mr. Bates and his son, of the L.T.C., on their " Prenicw" sociable; they kept him in sight for about $1 \frac{1}{2}$ miles. Just before completing the 100 miles, Mr. Woodhouse, by arrangement, met Mr. Nixon in order that he might time him in at the finish by the same watch by which he started him, and also check his Stanton's log. Mr. Nixon completed the 100 miles at 6.22 p.m., making 9 h .22 m ., including 30 mivutes for stoppages. The roads were very loose and the wind heavy against him going, and "choppy" coming back. He rode a light 48in. "Premier" roadster, geared up to 55in

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## 1883.

THE

## APR 23 '1940

## TRICYCLISTS

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AND

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A GUIDE TO THE PASTIME,
AND
COMPLETE CYCLOPÆDIA ON THE SUBJECT,
By Henry Stwomey,
AUTHOR OF THE "COMPLETE GUIDE TO BICYCLING," "THE INDISPENSABLE BICYCLISTS" HANDBOOK," EDITOR OF "THE CYCLIST," ETO., ETC.


## PRICE TWO SHILLINGS.



COVEntry : Iliffe \& Son, "The Cyclist" Office, 12, Smithford Street. London : H. Etherington, 152, Fleet Street.
america: The Overman Wheel Co., Courant Buildings, Hartford, Conn.

## PREFACE.



噱HE fact of the first Edition of this work having run out of print in three weeks, and the last-of double the quantity-in as many months, whilst both have commanded double, treble, and even higher prices, shows me that my work has been appreciated, and it is with pleasure I now place the third volume before the reader, in the hope that as the use of the Tricycle for pleasure and profit is spreading with such enormous rapidity, and the consequent development of the manufacturing trade in this direction all tend to show the subject to be one of interest and importance, the information given may prove at least of some value to those interested.

In the compilation of this work I have endeavoured to make my remarks sufficiently plain to be understood by all who may chance to come across them, and have made it my aim to be as accurate, exact, and fair as possible in both descriptions and comments, whilst I have arranged a comparative view at the end by which may be seen at a glance not only the prices but the weights, widths, and principles of driving and steering of each machine described, which renders the selection of a suitable mount much speedier and more satisfactory.

In conclusion, I trust that my efforts to spread the use of the Tricycle may not be in vain, and that a perusal of this book may be the means of inducing at least a few to become converts to the new mode of progression, which saves travelling expenses and doctors' bills at the same time, and renders its followers independent, healthy, good tempered, and intelligent, at but a moderate expenditure of the coin of the realm.

HENRY STURMEY.

## The Cyclist Office, Coventry,

May 19th, 1883.

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## SECTION 1.

## A FEW WORDS ABOUT THE TRICYCLE, WITH GENERAL NOTES ON CONSTRUCTION AND PRINCIPLES OF DESIGN.

闒HO would have thought three years ago that tricycles would have come so much into general use that not only nearly every crowned head in Europe, but many thousands of British subjects from the peer to the peasant would employ them for pleasure or profit in almost daily use? Yet such it is, and the incentive given to manufacture by such extensive patronage has been great indeed, so that not only has the machine itself been vastly improved in the healthy competition amongst manufacturers which has ensued, but the trade itself, as a natural sequence to its enterprise, has already reached important and pleasing dimensions, there now being some thousands of people employed in and dependent upon the manufacture of the tricycle and its adjuncts; the City of Coventry-which is the chief seat of the trade-possessing no less than nine firms whose sole or main business is the manufacture of the tricycle, whilst half a dozen others, in addition to a very extensive trade in bicycles, do an almost equally large one in the machines now under consideration, and several other houses are pushing in to share the benefits of the new industry. Many persons, no doubt, having become habituated to the sight of the bicycle flitting about our country roads and highways for many years have wondered on finding their attention drawn to the tricycle by reason of its increasingly frequent appearance "why they were never thought of before;" and indeed to the generality of the public who have never noticed the three-wheeler before, and who consequently reckon it an entirely new vehicle, this would doubtless be a very natural question. The tricycle, however, as such, is an older vehicle than the bicycle, or two-wheeled machine, and my earliest recollections of a self-propelled vehicle are connected with a tricycle. For many years, however, the improvement of the bicycle and its manufacture monopolised the entire attention of inventors and makers, and as that vehicle emerged from its chrysalis and developed into the machine of the present day, it so far distanced its neglected confrére, that the latter came to be considered a hopeless case, and a kind of thing which no one but a madman would think of using whilst a bicycle was to be had.

The arrival eventually at the bicycle of to-day in its very near approach to perfection rendered further improvements not only unnecessary but almost impossible, and inventors, given the cue by the late Mr. James Starley-who brought the three-wheeler from the obscurity into which it had fallen, and placed it for the first time for many years before the public in a practical and presentable formfrom about two years back have given almost their sole attention to the improvement of the once despised machine, with a result
which has not only astonished themselves but opened up a healthy, invigorating, and economical pastime to thousands of men who would never have taken the trouble to learn to ride the bicycle, as well as to the fair sex, to whom the bicycle was of course a sealed book; whilst the incentive given to trade by the introduction and success of the improved vehicle has been enormous, and the consequent competition, combined with experience learnt with the bicycle, has rendered improvement rapid and remunerative, so that although in itself quite an ancient vehicle, the now vigorous movement in its favour and the present principles of design upon which it is built may be looked upon as novelties, and the use of the improved machine as opening up a new method of progression, a new sport, and a new branch of manufacturing industry, all of which tend in their own small ways to the elaboration and completion of the civilization of the world, and of England in particular.

The question as to the superiority of the bicycle or the tricycle is one which cannot be answered off-hand, the true solution depending entirely on the standpoint from which it is viewed ; for whilst neither vehicle is entirely superior to the other, both have their strong points as well as their objectionable ones, and the manner and objects of the consideration of these points will make no small difference in the result arrived at; for instance, looking at them generally, when speed and appearance are the main points sought for, the tricycle has no possible chance of success against its lighter and more elegant confrére, but the reverse is the case if comfort and more universal utility are the chief objects desired in the selected mount. Thus, speaking widely, the tricycle is more cumbersome and heavy than is the bicycle, but at the same time possesses more stability, requiring no agility to mount and propel it, and no skill to balance, and although liable to capsize if unskilfully or recklessly managed, is yet minus that species of fall peculiar to the bicycle and known as the "cropper," which is, indeed, the chief and almost only danger incident upon riding the two-wheeler. In the matter of cumbrousness the tricycle is certainly at a great disadvantage, for whereas a bicycle can be run in and stabled almost anywhere, behind a door or in the rider's bedroom, and can be readily carried up and down stairs when necessary, the tricycle in general requires a special stable to itself, for if placed in either a wide hall or passage it is terribly in the way, and besides, too, many tricycles will not pass through the width of ordinary doorways, and it must be borne in mind that most attempts to make them narrower for that purpose materially affect their stability and general safety, whilst although some few are made collapsible and detachable, it involves more or less time to put them together, or in order, for a run. This matter, which is a very important one in affecting to a serious degree the spread of tricycling, has, however, received considerable attention of late, and the time and trouble necessary for this purpose has, by several patents, certainly been reduced to a minimum, so that a rider now can obtain a machine which by the turn of a few nuts, \&c., he can fold up and
stow away in a couple of minutes and restore to rigidity in a similarly short period, and so in a great measure counteract the lack of convenience for housing.

Considered solely as a matter of speed, the tricycle can never hope to equal the bicycle, as, on account of its construction, there must always be more weight, more frictional resistance on account of a larger number of bearings and greater road resistance, yet, nothwithstanding these things it can, and will, approach very near the two wheeler even in this respect, as in a road competition of 50 miles the distance has been covered in 3 h .47 m . 40 s ., or a mean speed of over 13 miles an hour, and a tricycle of any ordinarily good make can be sent along at a very tidy pace and, indeed, can generally be propelled, after a little practice, at a very little less rate than that at which an ordinary bicyclist travelling for comfort would progress, whilst for taking long journeys a tricyclist has a great advantage in the absence of the major part of the vibration consequent upon rough roads, which is experienced upon the bicycle. True, he does not escape many jolts of varying magnitude and unpleasantness, not being able so easily to steer clear of stones and other impedimenta to a smooth passage, having either two or three tracks to look after in place of a single one; but the steady and open construction of the tricycle, and its width in particular, allow of so many arrangements of elaborate springs, which are neither more nor less than an impossibility with the bicycle, that the shocks consequent upon meeting and passing over these obstacles are lessened and reduced in a surprising degree, this result being also attained by the position of the rider, who in the tricycle sits, not immediately over one wheel as with the bicycle, but generally between the three, each of which supports its share of the weight, thus causing the shocks and bumps consequent upon passing over rough ground to partake more of a swaying or jolting nature than the sharp, sudden, upward, vertical jerks experienced with the bicycle. As a business vehicle for use amongst traffic and crowded streets the bicycle is not to be compared with the tricycle, for whereas but few riders are skilled enough to keep their seats on the two-wheeler when almost standing still, as is necessary in encountering the casual and momentary blocks of street traffic, one of the chief features of the tricycle is that it can be propelled at as slow a rate as desired, as well as kept stationary when necessary, so that not only can all the vagaries of a crowded street be met as circumstances require, but the tricyclist can sit still and chat with a friend, take a rest half way up a hill, use his machine to sit upon when watching any fêtè or sports he may have ridden to see, and enjoy the hundred and one advantages accruing from the possession of a portable and steady seat.

In urging the especial claims of their favourite steed I have often heard it stated as a great advantage over the bicycle, that whereas with the latter vehicle one has to go through a regular course of instruction during which the knocks and tumbles one receives are more or less a certainty, with the tricycle no learning is required.

This, however, is not so good an argument as many seem to consider, and is apt to lead the unwary novice astray, for although no especial skill is necessary to actually sit upon and propel the vehicle -a child may do it easily the first time-anyone labours under a great mistake who imagines that the mere fact of possessing a tricycle gives a man the power to ride off for 20 or 30 miles without fatigue, and manipulate his tricycle as a tricyclist of experience can do. Those who have been accustomed to ride a bicycle do not, with a rotary tricycle, feel this anything like so much as does a person taking to the three-wheeler without previous experience in the matter in any way. The facts are these, that though the acts of sitting upon and making a tricycle move along upon the high road are simple enough, quite a different set of muscles is called into action, and it takes some little time to get these into proper tri:m for the work required of them, and constant practice is necessary in order to gradually accustom them to their new action and enable them to work with the minimum amount of fatigue. Constant, attentive, thoughtful practice is also requisite to give the tricyclist perfect command over his steed. It is like driving a fresh horse; he has to become accustomed to its vagaries, tricks and peculiarities of motion, to accustom his wrist to the exact amount of twist requisite in turning at angles of various degrees, and so make his steed instantly obedient to the hand and eye; he has also to make himself thoroughly acquainted with its utmost capabilities, such for instance as not expecting it to turn sharply round in safety when going at full speed, as more than one beginner has tried to do and come to grief, whereas an experienced rider would never dream of attempting such a feat, and so on. Considered from a point of utility, either for business purposes or luggage carrying capabilities for touring the tricycle is far in advance of the bicycle, for although every pound added to the weight carried as luggage increases more than proportionately with the weight of the whole machine the labour of propulsion, still an almost incredible amount of "goods" can be carried without inconvenience on the tricycle if one does not mind the necessarily slower speed and harder work, whilst with the bicycle nothing like the amount is possible, and even a very little is in the way and awkward, that vehicle not being designed to carry much more than its rider, and consequently its luggage carrying capability is extremely limited.

For sociability, too, the tricycle holds the palm, for have not some of our most attentive manufacturers given us the fullest possible arrangements whereby the partners of our lives-or any one elsemay enjoy not only the walks, but the rides of life in company with ourselves? And I may here mention that these sociables, as the double machines are called, are the pleasantest things out, and riding upon them even with one of one's own sex is more enjoyable than any other form of cycling I know; and they are coming so rapidly into favour, that already several manufacturers have found it a paying speculation to lay down the necessary plant for the pro-
duction of machines which can be used either by one or two riders ascircumstances require; these "Convertibles," as they are called, not only rendering the stowage of a double machine easier, but enabling a man at a trifling extra cost to have a machine which he can use for business purposes by himself or for pleasure trips with a second person, without being obliged to go to the expense of a separate machine for both purposes.

In the matter of simplicity of construction and smaller number of parts the bicycle holds premier position, but it must be remembered whilst considering this question, that-although there are more parts to get out of order in a tricycle-a loose nut or screw, or a part a little out of order, is not of so much immediate importance as is the case with the two-wheeler, with which the slightest looseness anywhere causes either very great discomfort, considerable danger, or absolute incapacity for work.

Different patterns of the tricycle require different management, and as there are already a very considerable number of varieties of this machine, each possessing some peculiar features, peculiar to itself, a little consideration of the general action of the different patterns, and the gerieral principles of design upon which they are or ought to be constructed will not be thrown away by the intending purchaser of a three-wheeler.

Notwithstanding the very numerous patterns of the three-wheeler now upon the market, it is only very recently that anything like a general study of the principles of design has been made by the manufacturers, most until now having been content to copy bodily the unprotected machines of other makers, adding only some small minor specialities of their own; but makers are beginning to see that success in this especial branch of their trade is only to be gained now by a careful study of their subject, and a more general reconstruction of their machines throughout with an entire departure from the old lines, and are acting accordingly. Of course, as with most other things, no one machine can-or has not been yet designed which can-combine in itself all the desirable points a tricycle should possess, but notwithstanding this there are a very fair number of extremely creditable and useful machines now in the market, in the selection of which the discriminating purchaser will decide according as he may consider the points gained, by the particular construction of the machine in question, to be of more or less advantage to his or her particular circumstances and requirements.

To be anywhere near perfection a tricycle should combine in the highest degree the three points-safety, comfort, and speed, or more properly safety, comfort, and ease of driving, for, except for racing purposes, mere speed had better be left out of the question, though it may be taken as a general axiom that a machine possessing great speed necessarily runs with considerable ease.

With respect to the general patterns of the tricycle now upon the
market, the old " bicycle" pattern has almost entirely disappeared, and we have now mainly modifications of the "Bath chair" pattern, which have been found by experience to be generally safer and more comfortable, and quite as speedy. The Bath chair variety may be sub-divided under two heads according to their method of steering, i.e., whether their steering wheels are before or behind, the former being at present the favourite on account of the lamentable ignorance of the subject displayed generally by the makers of the latter style. As a general thing the regular "Bath chair" pattern of tricycle has two large driving and supporting wheels, preceded by a smaller one, which is used for steering purposes, and little variety is observable except in detail. The modifications of the sub-division or rearsteering variety chiefly consist in either bringing the steering-wheel to one side, making the side wheels unequal, or in lowering the centre of gravity by driving small multiplied wheels in place of the large ones with direct power, each of which plans possesses points of recommendation peculiar to itself. With front-steering tricycles the rider is in general more comfortable, can be placed more upon his pedals, and has greater command over the guidance of the machine, not only by reason of the wheel being in front and therefore in sight, and the hand following the eye better with it there, but because greater weight can be and is placed upon it, enabling steering to be effected with greater quickness and more certainty.

The chief point in favour of the rear-steerer lies in the possession of an open front, nothing being in the way of the rider's feet, so that in the event of a capsize or threatened collision he seems to have a better chance of jumping out in front and getting clear of the machine without fear of catching himself in the gearing; whilst another point in its favour is the greater facility afforded by the long backbone for the support and carriage of luggage, both of which are great desirabilities, besides which, this class being simpler in construction, are, as a rule, lighter than the front-steering varieties, and what is more, cheaper; this latter item evidently being accountable for the large number of this class at present in use, and all of which points will weigh very considerably in its favour. When makers of this type generally consider their question scientifically, and following the example of M. D. Rücker, Junr., \& Co.-Palmam qui meruit ferat, please!-place a sufficiency of weight on the steering wheel, and give a vertical in place of a thrusting action, and when a perfect balance gear has been invented* which can be easily and successfully applied to this class of machine-for, at present, nearly all rear-steerers being single-drivers, and the weight upon the steering wheel being usually so little, the machine is made to steer very erratically, especially when going fast or over very rough ground, this being increased when-as in ascending hills-the rider rises from h:s seat and puts his weight upon the pedals, in which case in

[^0]some machines I have found the hind wheel to actually tilt up, when of course " the steering is lost" immediately, a result very awkward and even dangerous with single-driving machines, though somewhat modified in those using two chains.

A pattern of tricycle, somewhat akin to and growing out of the last, is that in which the wheels are all of unequal sizes. This principle, originally introduced for the purpose of reducing weight before the multiplication of a smaller wheel came into favour, is good insomuch that it does reduce the weight where a large driving wheel is used, as well as giving the rider more freedom of body - this, too, is an advantage with the small equal wheeled patterns -upon one side, but I find, as far as my experience, goes, that the running is not sc steady as with equal wheels, there being more or less a swaying motion and unsteadiness connected therewith, inseparable from the inequality of the wheels, and that the awkwardness of having one large wheel towering up upon one side is felt when driving upon a sloping road with the smaller wheel on the lower level.

Of the "bicycle pattern" there are less varieties, these being built principally for speed or appearance only. The system in the main may be described as all the front portions of a bicycle, having, however, in place of the rear wheel a horizontal bar some 2 ft . across, carrying a small wheel at each end. About the only thing that can be said in their favour is that with a great deal of the appearance of a bicycle, and with exactly the same position of body and action of the feet, the machine will stand upright by itself, although if much speed, and safety too, with this class of machine is desired, the rear wheels must be brought so close together that even this recommendation is no longer present, and the machine, whilst being a tricycle in name as possessing three wheels, is practically a bicycle, as none but a bicycle rider, and he a practised one to boot, is able to navigate it. With the common forms (as sold by many firms for the use of children) the machines, although able to stand upright by themselves, are extremely dangerous, as of course they are only ridden by those unskilled in the art of riding the bicycle, and on coming to uneven or sloping ground the machine is thrown so much out of the perpendicular that a fall is almost inevitable. Some one or two varieties having patented methods of driving are considerably safer, as the makers aim not at the utmost elevation possible, but place the rider some distance down the backbone, though even these are now almost obsolete. Turned "right about" and driven in the opposite direction, this form of machine possesses considerable merit, the rider being seated low, with an open front and central driving-three very desirable points, although their method of combination causes an amount of sway, and the number of stay-rods and braces adds somewhat considerably to the weight.

A form of tricycle taking a middle position between the two varieties is that so well known as the "Coventry" tricycle. This has
many advantages, notably its great safety compared with other machines of the same narrow dimensions, the great ease with which it may be turned, and the steadiness both up and down hill, which latter requisites are brought about by the rider being placed midways between the two steering wheels, each of which occupies a position either far in front or a like distance in the rear, a peculiarity which also gives the rider a great advantage in the application of his weight to the pedals when ascending hills.

Of the two general methods of transmitting the power to the driving-wheels, I think the rotary motion superior to the ordinary lever action for many reasons. In the first place, the motion is more analogous to that produced in riding the bicycle, and this seems to me to be much the easier and less fatiguing of the two, although I may be mistaken, as I was long accustomed to the action of a bicycle before I attempted the propulsion of a tricycle. Be this as it may, it is very probable that a person altogether new to the exercise would find little difference between the two methods; for my own part it seems to me that the lever action is not so well calculated for a high speed, the motion being more jerky, that there is a more decided dead point, and that the knee being brought higher up in the recovery stroke, the muscles just above the knee are more strained, especially in hill work, and the appearance also is not enhanced by it.

Both methods have great facilities for obtaining power at the expense of speed or vice versa, but I think in this matter as well the rotary action holds the premier position, not only because with an increase of power, with the lever motion, the height of the leg throw is increased unpleasantly, but also because with the rotary motion no difference whatever is made in the throw of the cranks, but, by the utilization of large or small toothed wheels speed may, for a level country, be gained to any extent by increasing the revolutions of the driving wheel when compared with that of the pedals; whilst on the other hand, by increased revolutions of the pedals in comparison with those of the driving-wheel, power may-although of course at a proportionate loss of speed-be gained ad infinitum; this method of "gearing up," "gearing down," or "gearing level" being one which has lately excited much attention, and the aim of more than one inventor has been to secure in one machine all three gearings at will, so that by the turn of the handle or the movement of a lever, the proportion between speed and power can be regulated according to the nature of the roads, the circumstances of wind or gradient, etc., etc. Several methods have been before the public for some time now, but the disadvantage of friction and other causes attending their use have been such as to nullify to a great extent their gain; still I am convinced that a method which shall attain the desised ends on a double driving machine, with a minimum of attendant disadvantages would be a valuable acquisition, and a successful commercial speculation if properly made and energetically put upon the market. As a general thing, in place of driving large wheels
geared level the plan somewhat recently introduced of driving with smaller wheels, geared up, is one which I highly approve of for fair roads, light work and racing purposes, for although I am perfectly aware that there is considerably more friction generated by so doing, I am of opinion that the reduction in weight more than compensates for this, whilst the centre of gravity being brought so much lowerthe width remaining constant-the safety is very considerably increased, and I also think that, provided tne reduction is not carried to excess, the application of good thick rubbers also quite compensates for any little increase of vibration or jolting likely to be experienced; so that in considering this principle we have really to weigh a considerable increase in safety against a slightly more lowly position and appearance, the latter of which cannot but, I think, give way before the superior advantages of the former. Of course, under the circumstances of a weak rider and very rough or hilly roads the reverse is advisable, i.e., using a 48 in . or 50 in . wheel geared down to about 42 in .

A very important point in the construction of a tricycle is the position of the driving-wheel, which may be either before, behind, at one side, or on both, and this matter resolves itself mainly into the question of the respective superiority of double or single drivers. To those uninitiated, a double driver is a machine with two equal carrying wheels, both of which are driven, whereas with single drivers only one of the three is driven. According to theory, the application of power should be central, and, without a doubt, the single driving wheel should be best when in a central position, no matter whether leading or following, but for the fact that this position is an awkward one for many reasons, necessitating usually if in front-except in regular bicycle pattern machines-an incomplete arrangement for steering with the two rear wheels, and if behind militating as a rule much against the carrying of any luggage, as well as being more or less unsteady unless heavily braced and clamped. The single driving-wheel when placed upon one side is therefore generally preferred to the central position for general purposes, on account of the greater comfort of machines thus built, and the greater facilities they possess for luggage carrying and other important and useful peculiarities. The chief objections to the single side-driving wheel are the swaying motion produced by the repeated pressure of the feet and propulsive power being on one side only, the fact that it has to drag in a more or less awkward manner both the other wheels through the mud, and the dangerous knack it has of swerving sharply round should the steering be lost for a moment either in propelling or sudden back pedalling. The first objection is not always readily perceived, this being the case when there is a sufficiency of weight upon the steering wheel; but if a rider-say in hill mounting-manages to lift his steering-wheel off the ground, the result is apparent immediately, for the machine twists round as if upon a pivot, the geared wheel directly driving round the loose one ; this is also the case if the steering rod becomes
by any means disconnected with the rudder wheel. When running upon a level road and at a moderate pace the sway is not very perceptible, but let the rider force his machine at a good heavy pace over uneven ground, or "rush" a hill, and he will quickly find the difference. The only single side-driving rattern of machine where this is more or less unfelt is that with fore and aft steering (as the "Coventry"), with which the long leverage of the two rudder wheels keeps the driving-wheel steadily in one direction, although the side strain must be ever present, and though in the main unfelt, considerable.
In double driving machines the wheels are placed one upon each side, and to be properly constructed they must so work automatically that whilst each wheel drives when running straight ahead, allowance is made by them in turning, the outer rotating at a greater speed than the inner one. Of course, by fixing two wheels rigidly upon the same axle both may be driven when travelling in a straight line, but when a departure from the straight is made, however slight, a certain portion of the arcs of two concentric circles has to be described by each wheel, and naturally, as the circumferences of concentric circles are larger as they depart from the centre, the outside wheel-or that farthest from the common centre-will have the greatest distance to travel, and this it will be unable to do unless allowed to revolve separately. It is this which necessitates the use of single driving-wheels by manufacturers who have no arrangement by which this necessary automatic action can be obtained. Mechanical clutches, thrown in and out of gear by a separate handle, have been tried, with which the wheels may be thrown out of gear when taking corners, both being driven upon the straight, but this plan can never properly answer on account of its involving a separate action on the part of the rider, which is very likely to be forgotten in a sudden emergency, when the omission would involve, very probably, serious consequences, as, with both wheels in rigid connection, the machine must keep straight on or capsize in the effort to turn. I am, however, much more favourably inclined towards the plan of connecting the clutch gear with the steering gear, so as to cause it to be automatically thrown in and out of gear on all curves. This drives double perfectly, and is by no means so dangerous, provided the clutch gear is mechanical, well made and instant in action. During the last two seasons a number of machines have been introduced, in which a chain is used to each wheel, and friction clutches, or a ratchet and pawl, used to each; so that when travelling straight both wheels are driven, but either wheel is free to "run over " the clutches and make a larger circuit than the other. These plans are very good substitutes for the real thing, and are by no means bad in their way. True double driving is, however, only obtaned by the use of a balance gear, with which both wheels are driven at every point and the " balance of power " maintained, each wheel getting an amount of power exactly in proportion to the proportionate speed at which it is required to travel, and the
outer wheel in making curves is always driven strongest, whilst with balance gear back-pedaliing is possible, whereas all two chain. clutch motions do not admit of this necessary action without some separate mechanism. During the past two seasons the advantages. of double driving gear seem to have made themselves felt, if we may judge by the number of patents taken out to secure the desired ends, and the great proportionate increase in the number of double driving machines put on the market.

Some manufacturers I have heard argue against the principle, upon the ground that the automatic gearing employed in reality causes but one wheel to be driven when travelling in anything else but a perfectly straight line; but, given that this is a fact-which it isn't with balance gear, though it is with the two chain motion-it must be admitted that if both wheels are driven and power applied upon each side of the machine equally for, say 75 per cent. of the time, this is far better than not driving with both wheels at all. This is on the principle that "half a loaf is better than none." The chief advantages of the double-driving system are that the swaying propensity is absent and the running at speed consequently steadier, and that as both wheels drive, if an obstacle is met by one the force exercised by the rider is not checked and taken up solely in getting over that obstacle, but is taken up by the other wheel, which continues its steady motion, and with a little help from its fellow, drags the unfortunate one over the obstruction and sets him going again without much hindrance ; likewise two wheels, each at work, can naturally drag along one with far more ease than can one wheel, work it never so hard, drag along two others each in more awkward positions, being indirect with the line of pull.

In considering the different foot motions and wheel gearings a very important point is apt to be overlooked, and that is the ability or otherwise to "back-pedal," i.e., check the machine with the feet or propel in a rearward direction, a point of great importance when we consider the desirability of slight checks to the speed, stops and reversions in traffic navigation, as well as a fall back in case of the failure of the brake, or as an assistance in the event of an insufficiency of brake power at any time. With regard to the arrangement of the wheels, some little consideration must be given-in addition to the points in this direction already noted-to the manner of placing them upon the road, for they can be so arranged as to make either two or three tracks, and the rider has to consider whether the slight increase in erratic steering which sometimes occurs-this is not the case with fore and aft double steering-with two track machines is compensated for by their running smoother and being less liable to meet with obstacles, two tracks being better guided clear of stones and ruts than three.

The position of the handles, although seemingly a small matter, is in reality very important, yet notwithstanding this, manufacturers generally, until last season, seemed quite to have overlooked it in
their calculations, and the result consequently is, that in comparatively few machines the handles are in the best position; they are either too high, too low, too far back, too far forward, tco close together, or too wide apart, and excess in any of these directions is both unpleasant and fatiguing. To be in the proper position for general work the handles should be just at the level of the hands when the rider is sitting upright, and should also be in a direct line between the shoulders of the rider, and a point some 3 in. fo: ward of the pedal centres, and just so far apart that whilst not so wide as to cause the arms to be stretched outwards, they should not be so narrow as to oblige the rider almost to squeeze himself in and out between them. The most important of these positions is the height, for if they are too low the shoulders are brought down and forwards to meet them, the result being a most awkward and ungainly appearance, and considerable discomfort and extra fatigue to the rider ; whilst on the other hand should they be set too high, the arms are bent when holding them, and a direct pull cannot be obtained, whereby the strain upon the shoulders and muscles of the arms is rendered severe, and no small amount of power is expended uselessly, and consequently lost. Now, in considering this point, it will be seen that what suits one rider will by no means suit another, not only on account of the different length of arm, but also because a short person lowers the position of his saddle, whilst a tall one raises it, and many men of equal length of arm, by reason of a difference in length of leg, ride with the saddle at different heights, so that a constant height of handle for all riders is altogether wrong; indeed, as most riders adjust their seats to suit themselves, 1 do not think manufacturers can suit everyone in this matter, even when specially building the machine, except by making the handles adjustable., I consider this one of the most important factors towards the success of the machine, and am sure that next season no machine worth having will be sent out without them. Already nearly every good firm has adopted the principle, though making an extra charge for the fitting of adjustable handles, and this is a considerable satisfaction to me, as in the first edition of this book, when but two makers had ever applied them (and even they had ceased to do so), I called attention to the great defects of a machine not thus fitted, and have since, several times, pointed out the defect in The Cyclist, so that it seems my efforts to effect improvement in this direction have not proved ineffectual.

In the arrangement of the frame of a tricycle the extent of the wheel base should not be left out of consideration, as the stability and safety of the machine is in no small degree dependent upon the proper proportion of the wheel base to the perpendicular height and position of the centre of gravity. I have noticed with some makers recently a tendency to bring all the wheels as closely together as possible, for the sake of appearance. A graver error in constructional judgment could hardly be possible, for if we take the tricycle and its rider to represent a triangular pyramid, it is easy to see that the
larger the wheel base in proportion to the height the less liable will a machine be to capsize.

The construction of the brake is another point until recently left almost out of consideration by many manufacturers, but which is one of the most important I know of in the construction of an allround touring machine. Whether acting upon the tyres of the wheels or on specially constructed drums, they should be perfect in their action, and no half measures be allowed; some makers seem to imagine that almost anything will do for a brake, but it is needless to say this is a great mistake. A properly constructed brake will act in such a manner that however suddenly applied it will not in any way affect the course of the machine by causing it to swerve in either direction; it will also have sufficient leverage in the handle, and surface to the spoons or straps to enable the machine to be kept well in hand down really steep descents with comparatively little strain upon the hand and arm. The plan adopted by one or two makers last season of fitting catches to hold it in any position without strain on the hand is an excellent one, and one which I hope to see in time universally adopted. In purchasing a tricycle for road work, especially in a hilly district, all should insist on great length in the lever, long and broad spons biting the tyre throughout their length, or broad deep drums with straps biting all round and strong safe connections.

These and many other points have to be carefully gone into in building a tricycle or selecting a mount, and above all it must not be forgotten that simplicity is a great desideratum; and of two machines fulfilling the same requirements, the simpler is almost sure to prove the most satisfactory in the end.


## SECTION II.

ANALYSIS OF THE TRICYCLE.
 N account of the total difference in shape existing in many of the varieties of the tricycle, few portions, comparatively speaking, are common to all, and thus the work of analysis can never be so complete as can be that of the bicycle, all of which machines are built upon the same general lines. Still there are many parts, such as the wheels, bearings, steering and driving arrangements, and seats, which in one or other of their modifications enter into the composition of all tricycles, and these it is my intention briefly to review and compare together, that their construction, peculiar uses, advantages, and disadvantages may be the more easily understood by comparison, and the simple mention of them by name, in the notices of the entire machines, be sufficient and save the necessity of repeated descriptions of the same thing.

## THE WHEELS

Claim our attention before all other parts, as in them the greatest similarity exists, and, examining these piece by piece, we find them in all cases to be furnished with

Tyres, formed of a continuous rope of india-rubber stretched round the wheel, and held firmly by a cement specially manufactured for the purpose. These tyres, of course, form the medium of contact between the earth and the wheel, and in times gone by were formed of iron bands, in the same way as are those of an ordinary cartwheel. In machines of the present day, however, they are, as I have before remarked, composed of india-rubber, which substance yields to the slight inequalities of the ground, thereby doing away in a great measure with the bumping and jarring felt with the old-fashioned iron ones, besides giving that quietude of progress which makes tricycling so delightful.

This india-rubber in shape is round, and is of various quality and density, some tyres being very soft, whilst others are just the opposite; in most cases the latter are of very inferior quality and therefore cheaper in price, this kind being usually put on cheap machines, as the rubber forms one of the most expensive items to the manufacturer. A rather soft rubber is best, as it gives more to the unevenness of the road; but it should not be too much so, or it will more easily receive cuts from sharp stones, \&c. In colour, tyres are either red or grey-most generally the former-the colour being simply a dye. In appearance the red has the advantage, consequently it is, and has been, a great favourite with riders on this account, and also by reason of a mistaken notion that tyres of that hue were indestructible. The common tyres are made of rubber rolled into shape before solidification, and have consequently a
ragged, uneven juncture, and are by no means uniform in thickness, consequently

Hancock's Moulded Tyres are preferable, these being cast into shape in moulds. They are made in five sizes, from $\frac{5}{8}$ in. to iin., and are beautifully smooth and even, and may be recognised by the very straight, clean, even moulding ridge which will be found upon them.

Thickness depends much upon circumstances, and should be regulated accordingly. For a heavy man, heavy machine, or rough roads a thick tyre is best, and vice versa. As a rule their diameter is $\frac{7}{8} \mathrm{in}$., but if comfort and durability be desired, rin., tyres will be found much more suitable; for racing machines $\frac{3}{4} \mathrm{in}$. or even $\frac{5}{8} \mathrm{in}$. will be ample. The sizes I have mentioned must be taken as referring mainly to the large carry:ng wheels, the rudder wheel being generally provided with rubber $\frac{1}{8} \mathrm{in}$. less than that used on the others.

It must be remembered that a machine will last much longer when fitted with a good rubber than otherwise, as the jars and sudden shocks consequent upon travelling over rough roads are materially lessened, thus decreasing the liability of the various parts to loosen and wear.

The Victor Moulded Rubbers are made in America. They are cast in one piece without join at any part, so are perfectly even throughout, and have not even a join as all others have. They are made of the best Para rubber, and are very pliant and good.

Hancock's Patent Combination Tricycle Tyres are an improvement on those in ordinary use, as they wear much longer. They are made of two qualities of rubber, the side which comes in contact with the road being white and very hard, so that it is not easily cut, whilst pliancy is obtained by having the other side (the greater part of tyre) of the best soft red rubber. This patent tyre is made in three patterns, one being round like the moulded ones, a second having half a dozen grooves cut through the whole length of the red or soft part of the tyre, which gives the cement a wonderful hold upon it; whilst the third style has one deep groove cut on each side midway between the two qualities, the cut side of the hard outer rubber forming a firm edge with which to better obtain a bite on a greasy road. This last variety is especially well suited for the small steering wheels, on the tyres of which there is great side strain, which frequently causes them to slip or skid.


HANCOCK'S COMBINATION TRICYCLE TYRES.
All these different varieties of tyres are, or ought to be, secured either by vulcanising or the use of cement into the Rims, Felloes, or Steel Tyres (as they are sometimes termed by manufacturers), which are of several patterns, those in use upon tricycles being as follows :-

The Crescent Rim, constructed of rolled steel, resembles the letter $U^{\prime}$ in shape, or, more properly, the new moon or Turkish crescent, being thick in the centre, and coming to a fine edge at the sides, by which the liability of the tyres being cut by getting nipped between the edge of the rim and any stones the rider may pass over, is obviated to a great extent.

Warwick's Potential or Fluted Felloe may be described as a rim of crescent section with a fluting or $U$ shaped depression in the centre, as shown in the illustration. It is very stiff and firm, but little used.


WARWICK'S POTENTIAL RIM.
Bell's Patent Rim is deep in section, and is indented or compressed along the sides, the edges curving outwards again as shown in the accompanying sketch, the section being somewhat that of a tulip.


Of course, a special shape of tyre is used with these, and their object is to prevent all possibility of the tyre coming out, and at the same time to give greater downward depth of rubber. They would be the best thing out for the steering wheels of tricycles, but they are made too thin in the centre, and are not yet perfected in manufacture, consequently they " buckle " easily. When right, they will undoubtedly be the best form of rim extant for all wheels subject to severe side pressure.

All the Rims just described are constructed of solid metal, and up to the close of last season were the only ones used on tricycles. The building, however, of special racing machines which came into favour last year has now caused hollow felloes-which have been used on bicycles for many years-to be rather frequently used. They are, as a rule, somewhat lighter than solid ones, and at the same time very much stiffer and more rigid. There are several varieties of them, as follows :-

The Club Hoilow Felloe, constructed by passing a tube of round steel through rollers which bring it to a section similar to the ordinary crescent, but thicker in the middle and, of course, hollow.


THE CLUB HOLLOW FELLOE.
Clément's Hollow Felloe, like the last, is made of a continuous tube of steel, rolled to shape. It is, however, of one uniform thickness throughout, being made of thinner metal, and in shape is deeper and narrower, more resembling the one next to be described than the last. It is a French patent, and is made in Paris, as well as by two firms in England.


The Invincible Double Section Hollow Rim is constructed of sheet steel rolled to a deen $U$ section, on the top of which is brazed a second but shallower sheet, having two overlapping flanges. As with the last its great depth interferes but little with appearance.

The Humber Hollow Rim is likewise constructed of rolled sheet steel, but in this case three, and not two, portions are used. The outer sheet forms a deep $U$, with flanges turned inwards, and bearing upon the other two, the upper one of which is a shallow groove resting upon the inner one, which, in shape very much resembling the Potential solid rim, supports and stiffens the other two. Like the previous one, it is very light and rigid, and the spokes bearing upon the outer case tend to draw the whole together, and keep them from coming to pieces.

Warwick's New Hollow Rim is the latest introduction in this line. It is made from a single piece of sheet steel of equal thickness, the two edges being brazed together one over the other, the junction taking place along the bottom of the rim. In section it somewhat resembles Clement's, but is broader and flatter at the bottom. It is very stiff, and the spokes screwing into the bottom effectually hold the two sides together irrespective of the brazing, so that it is impossible for them to open, whilst the double bottom also serves as an additional "stiffener."

The principle of a wheel is that the rim should be perfectly true (or, in other words, a perfect circle) when separate from the wheel.

The Spokes, then, act as stays, keeping the whole firm and true; they also act as suspension rods, for the weight of the rider rests upon the centre of the wheel, and is suspended from that part of the rim which happens to be uppermost, by means of the spoke then most perpendicular. Thus the weight is constantly shifted from spoke to spoke as the wheel revolves, and they all being braced up tight, keep the rim from giving in with the weight. Spokes are of various kinds, and are composed of either charcoal iron wire, or steel wire cut to the requisite length; a head is hammered at one end, and the spokes passed through holes which are drilled at equal distances in the rim; they then proceed alternately to each side of the hub or centre of the wheel (shortly to be described), where they are secured by having a worm cut on their lower ends, by which they are screwed into the hub and adjusted as required; the best kind being " butt-ended," that is having the end of the spoke upon which the worm is cut "upset" or thickened to nearly twice the diameter of the spoke itself. The thickness of the wire used varies, but as a rule a size smaller is used in the small wheels than is put into the large ones. The size of the wire is determined according to the Birmingham Wire Gauge, that known as No. II being most commonly used for roadsters, whilst higher gauges even up to 16 are used for racing machines, and gauges as low as No. 8 for sociables and four-in-hands. As to the number of spokes which should go to build a wheel, my idea of the proper number is "spokes
for inches," i.e. a 40 in . wheel to have to spokes, and so on in proportion. Of course the more the spokes the thinner is the wire used, so that more spokes do not necessarily mean more weight ; but it must be remembered that more surface is presented to the air, which means so much more labour, especially in a high wind; also, more spokes take more time to clean, and being closer together, give much more trouble, on account of the difficulty of getting the hand and cleaning cloth between them.

Of the many modifications in vogue with bicycles, only two special ones have been adopted by manufacturers of the three-wheeler. These are:-

The Club Spoke, in which the thickened end is tapped and a conical, neatly fitted lock-nut, screws down and locks the whole.


THE CLUB SPOKE.
Laced or Tangential Spokes are mostly used with the hollow felloes previously mentioned. The hubs are of thin steel, and are pierced with small holes near the edges, and through these are passed lengths of wire twice the length of an ordinary spoke, and headed at both ends. Each length forms two spokes, which are carried alternately to the rim and there secured by means of small nipples. Being thin the spokes are light, and also offer little resistance to the wind, whilst by reason of their peculiar arrangementinterlacing or crossing each other, and setting at a tangent to the hub-the power is carried to the rim direct, which, being of itself so stiff, requires little assistance from lateral spokes.

The Hub, or solid centre of the wheel, may, in the majority of tricycle wheels, be likened unto a huge cotton reel of iron. As a rule the hub is either stamped in a solid mass, and bored and trimmed up afterwards, or is constructed by brazing a couple of 3 in . or 4 in . flanges, or circular discs of metal, to each end of a 6 in . tubular or solid centre. These flanges, forming as it were the sides of the reel, should not be less than 4 in . in diameter. They serve as a common centre for the spokes, which they hold securely in one
firm embrace, and also by their depth and width—or "dish "—assist in keeping the wheel true and firm, and it much depends upon the proper amount of dish given to these whether or no the wheel will " buckle" or double up with a side strain. As a rule the hub flanges of tricycles are of iron or steel, but occasionally they are of gunmetal, this being usually the case when direct spokes are brought into requisition. This hollow hub is that used upon the majority of tricycles, but with those with a central driving wheel like the "Challenge," "Dublin," "Bi-tricycle," and others, and with most central-geared machines, the hub and wheel is exactly the same as that used upon a bicycle, the hubflanges - generally of gunmetal in this case - being brazed and shrunk on to a solid axle which projects some two or three inches on each side, and is formed of steel or bar iron, $\frac{7}{8}$ in to rin. in diameter, and turned with a couple of shoulders upon it, close up to which the flanges are driven, sometimes being keyed or shrunk on in addition to the brazing, for greater security. The hubs of smaller wheels, such as the rudder wheels, in most tricycles, which work usually in a fork, are somewhat different, being exactly similar to those used upon the back wheel of a bicycle, and are usually constructed solid, of either steel, iron, or gunmetal, but are occasionally complex. They are, like the larger ones, hollow, simply having a hole longitudinally through them, for the reception of the wheel-pin. If composed of gunmetal or brass, they should be provided with a steel core to receive the friction, or they will soon wear out. In size they are from $3 \frac{1}{2} \mathrm{in}$. to $4 \frac{1}{2} \mathrm{in}$. dish, with flanges from 2 in . to $3 \frac{1}{2} \mathrm{in}$. in diameter, and are, as well as the large hollow variety, usually provided with a lubricator or oil hole Arilled through them centrally. These hubs, together with the rims, tyres, and spokes, are the whole composite parts of the wheels, to which motive power is applied by means of pressure upon pedals placed in connection with them by means of chains or levers and cranks of one or two kinds. Now these

Cranks with central geared tricycles are identical with those adopted upon the two-wheeler, which I may explain are of two kinds, viz., fixed and detachable. The crank itself is a flat iron or steel bar, some 6 in . in length, and in thickness graduating from about $\frac{3}{4} \mathrm{in}$. at the axle, to $\frac{1}{2} \mathrm{in}$. at the end; for the first four inches or so it is about $\frac{3}{4} \mathrm{in}$. in width, after which it widens suddenly out to rin.; in the centre of this wide part, a slot $\frac{1}{2} \mathrm{in}$. wide and 2 in . in length is cut; this receives the pedal, which by this means may be placed at any distance within the length of the slot, to suit the rider, and thus obtain a greater or less amount of leverage as required.

The difference between fixed and detachable cranks lies in the mode of attachment to the axle; the usual method for fixed cranks is to secure them by means of a " key," or thin tapering bar of metal, which is driven in between the axle and crank, fitting into slots cut for the purpose, the crank being first shrunk on, to give it a firm hold independent of the key.

In the Detachable Crank, however, at its base, the end or "boss" is suddenly widened out to about rin. in thickness, and through this an oblong hole cut, so that a wedge or cotter driven through it will pass into and exactly bear against a flat cut across the axle, the cotter being held in place by a nut on its smaller extremity. This latter plan has several modifications in the bicycle, but I believe none of them have been adopted yet with tricycles, makers being content with the original and simplest methods, the others being chiefly alterations for the sake of peculiarity. Those central traction tricycles not driven by direct pressure upon these cranks are driven by levers placed in union with them by means of chains and connecting rods. In most other-and the great majority of-tricycles, power is communicated to the wheels through the medium of a

Double Cranked Pedal Shaft, which is nothing more nor less than a bar of iron, bent or "cranked," so as to form as it were two cranks and pedal pins, one at each end, and departing from the main shaft in opposite directions, their ends facing each other and being connected by a further bending of the bar. This cranked shaft is either in actual communication with the driving wheelsas in lever machines, and some others recently introduced-or is placed some distance from them and the power imparted indirectly through a chain and wheel connection, or by means of rod or wheel gearing, and other patented devices to be hereafter described and commented upon.

Pedals for tricycles have as yet few varieties, and are usually of the variety known as the

Rubber Pedal, which consists of a metal tube some four inches in length, at both ends of which a flat oblong piece of steel is set at right angles; these are widened out in the middle to keep the foot from slipping off sideways, and the ends connected by small steel rods running parallel to the central tube; on these, bars of in. rubber are secured, upon which the foot rests.

This gives a firm, soft hold to the foot, but is rather slippery in wet weather; very much better in this respect being Hancock's Fluted Rubber Pedals, in which the rubbers-fitted either on round or $\mathbf{D}$ rods to prevent twisting-are of hard grooved or fluted rubber, of the same consistence as the surfacing of his combination tyres.


HANCOCK'S FLUTED PEDAL RUBBERS.
With lever machines, and those fitted with bicycle pattern cranks, these pedals are identical with those used upon bicycles, the ends of
levers being usually forked and the pedal fitted between the forks, working upon a pin or short rod, having its ends securely held by the fork ends. Sometimes these pins are plain, but more frequently they are coned at one end, whilst the other is provided with a worm or screw, upon which a moveable cone screws to and fro for adjustment, by which method, although some little extra friction is generated, all rattle can be immediately taken up.

The cranked axle, as used for most rotary machines, requires a slightly different construction of pedal, and for use with this, the pedal as described is made in two sections, which are provided with neat side flanges and screws, by which means the two are united and held in position.

The Triumph Pedals have a speciality in their construction, They have about one-fourth of the central barrel upon one side cut away, as well as the sides of the pedal plates. This allows them to be put on the pedal shaft readily, and when on, secured by the piece being screwed on in place, both pedal bars being upon the same section instead of as is the usual case upon the opposite sides of the pedal.

Singer's Patent Pedal is an improvement upon the ordinary type in the fitting and construction of the rubbers. Instead of the usual straight rods holding lengths of rubber, the sides are formed


SINGER'S PATENT PEDAL.
with three rings placed side by side, and in these rings small deep plugs of rubber are fitted, in shape very much resembling two acorns placed stem to stem. This makes a lighter pedal, and gives a greater depth of rubber and consequently greater freedom from vibration, whilst new plugs may be fitted at any time in a few seconds should they wear out.

Settle's Patent Pedal has a peculiarity in the rubber foot-bars, which are made double but united in the centre. Two bars pass through the thicker portions, which are thus held firm and prevented from slipping round with the pressure of the foot and thus throwing the foot off.

The Premier Four-bar Pedals are very neat affairs. They have four parallel and very light grooved bars or half-tubes, the edges of which are serrated and form excellent "rat-traps" for racing purposes, whilst by cementing rubbers into the grooves on either or both sides they are made admirably suitable for road work.

Block Pedals are used-though rarely-upon a few rotary-action machines, and also upon a few of the small lever machines for children, and consist of two oblong slabs of wood provided with iron end plates and sectional bearing tube, screwed firmly together upon the crank shaft so as to form a flat pedal surface.

The Rat-trap Pedal in general construction is the same as the rubber one, but the rubber bars are replaced by two flat pieces of steel, having serrated edges like the teeth of a rat-trap. They give a very firm hold to the feet, and are much lighter than the others, but are prone to wear out the boots. As yet they are not very largely used.

Starley's Roller Bearing Three-bar Pedal. In this three bars of rubber are provided for the feet, which thus always fall on a firm foothold, whilst in place of the pedal running on the plain crank each end is provided with a parallel box, in which a set of steel rollers, in. in length, are arranged, which take the whole wear of the pedal.

Ball Pedals are just being introduced into the composition of tricycles, and as far as regards the construction of the pedal itself may be of either of the above varieties, but most usually are of the rubber type. In place of a plain or coned pin, a sort of box or case with a very slightly coned inner surface is fitted at each end of the pedal, in which about a dozen small steel balls are placed, so that they take all the bearing of the pedal, and by revolving themselves when pressure is applied, remove a great part of the friction which otherwise takes place.

The Club Ball Pedal for double cranked pedal shafts is one of the neatest things I have yet seen. Steel bearing surfaces are fitted to the shaft and the two ends of the pedal, which, containing the balls, are made sufficiently large to pass over the shaft. They are then fitted with the balls, and the rubber bars screwed on to complete the pedals.

Rudge's Ball Pedals for cranked shafts are very neat and effective. The balls are contained in boxes forming the centres of the end plates, and run on a hardened collar secured to the shaft. Their leading feature is their adjustment, which is effected by means of a coned collar, which is provided with flats for turning, and is screwed up on the bearing collar and the balls adjusted at will. For the guidance of those who had ball pedals on machines of this make last year I may parenthetically remark that the pedal I have here described is a very different thing, last year's pattern being now discarded.

Edge's Ball Pedal is very much the same as those ordinarily used, the chief feature being that it is machine-made throughout, and is so constructed that it can be applied to any existing cranked shaft without special tools. All these are for use on double cranked pedal shafts, but where central gearing is used ordinary bicycle pedals are utilised, of which the following two varieties of ball pedais are in use on the three-wheeler :-

bown's adjustable ball pedal.
Bown's Adjustable Ball Pedal, in which the cases for the balls are placed in the pedal plates, and conical surfaces both upon the inner sides of the pedal pin and ball cases. The balls are placed between these, and, as shown in the illustrations, a cone working on a worm at the pin-end screws up and adjusts for wear, being firmly secured by a lock-nut when properly adjusted.

Rudge's Ball Pedals have a grooved case or box on the inner side of each footplate, in which a number of steel balls are placed, and the pin is provided with a grooved cone by which they can be adjusted.

Butler's Pedal Slipper, for use upon rubber pedals, consists of a light steel plate, the width and length of an ordinary rubber pedal ; its outside edges are turned up and serrated, and the centre has two spring cheeks in a downward direction. These latter grip


BUTLER'S PEDAL SLIPPER.
the central cylinder, and hold the "slipper" firm upon the rubber, thus converting one side of an ordinary pedal into a rat-trap ; being easily removable at any moment, and at the same time weighing but a few ounces.

## THE BEARINGS.

After the wheels and immediate belongings thereto, we naturally turn to the connection between the wheels and the framework; and this we find to vary considerably with the different makes, although the number of modifications of this important part of the machine is infinitesimal as compared with the two wheeler. All bearings are, or rather ought to be, constructed of steel, and should be, when the bearing surface is small, made as hard as possible. The great end sought for in bearings is to obtain the minimum amount of
friction, for, the greater the friction, the greater the useless expenditure of power, and consequently harder work in propulsion. With more friction there is more wear; it is for this reason the bearings should be well hardened, and as no bearing can run without friction, some arrangement should be made where possible to compensate somewhat for this inevitable result. The bearings for the larger driving and carrying wheels differ considerably from those used upon the smaller rudder wheels, as well as from each other, according as peculiarity of position renders alterations imperative. Four general varieties of bearings are in existence, viz., the plain, coned, roller, and ball ; the former and the latter being those most generally used.

Of Plain Bearings it is sufficient, as regards principle, to say that they aim at the production of two perfectly fitted surfaces, which are kept from actual contact with each other by a thin coating of oil, and thus run very sweetly if kept free from dirt and well lubricated. These bearings, for wheels fitted in forks, as with the central traction variety, differ in no way from those of bicycles, and may be described as being constructed in two ways, and consisting of two semi-circular surfaces of hardened steel, cesembling the two halves of a cylinder about sin. in length; one half fitting on the top of the axle, the other below it. This is the bearing itself. The difference lies in the mode of attachment to the fork and the adjustment. The first, and in my opinion the best plan, is that known as

The Sheffield or T Bearing, in which the upper part is a forging solid with the end of the fork, and is fitted with two projections, one on each side; the lower bearing is similar in shape, and is secured to the upper by means of two screws and nuts in the projections. In the other plan the fork end is shaped like a tuning fork, which fits over the axle; the bearings themselves are separate, and are contained between these, the upper one resting on the axle, while the lower one is tightened and kept in its place with a nut and cotter, working in small slots in the lower ends of the bearing-keeps, in the same manner as detachable cranks are secured. Sheffield bearings are the neatest; but with the others, the bearing can be renewed without any alteration of the fork ends, which is some advantage. These varieties are only used when the axle forms part of the hub and projects on either side the fork-ends and bearings for the attachment of cranks. With the smaller wheels the fitting consists of a simple plain pin passing through the centre of the hub as previously described for pedals.

Parallel Bearings, with fork-wheels, consist of a hardened steel cylinder some $1 \frac{1}{2} \mathrm{in}$. or more in length, which fits the spindle exactly; both axle and bearings are finished with a surface as smooth as glass, and as hard as it is possible to make them. To prevent the ingress of dirt and grit, which would of course wear them away, the boss of the crank is hollowed out, as is also the flange of the hub, and into these recesses the bearing runs, fitting accurately. This class of bearing is simplicity itself, and presents about the least amount of
friction of any, as, being long, it presents more surface, in consequence of which the weight is further distributed. Also, a drop of good lubricating oil between the two surfaces really receives all the friction up to a certain point, and the metal has no contact anywhere except at the ends, consequently any friction that exists is caused by the presence of grit or dirt, or a failing in the supply of oil. This variety is the most common in use with the large carrying and driving wheels of the typical tricycle pattern, the recessed hubs, cranks, \&c., being of course absent, the bearing being formed in the simplest manner possible, the long axle being hardened and. the hollow hub of the wheel fitted accurately to it, and likewise brought to a glass hard surface. The end of the axle is provided with a screw, and upon this a securing nut and washer screws, which are usually sunk flush, or nearly so, with the outside of the hub, which latter is recessed deeply for the purpose.

Coned Bearings are chiefly in use upon rudder wheels, and may be fully understood by reference to the same variety of pedal bearings. previously described, to which, indeed, they are exactly similar.

Roller Bearings are of far more practical use upon tricycles than upon bicycles, owing to the much greater length they can be made. As their name denotes, they consist simply of a set of steel rollers placed side by side upon a plain axle, and enclosed in a closely-fitting box or bearing case, the hollow in the hub of wheels of the typical tricycle type being simply made larger for the purpose, whilst those used upon "fork wheels" consist of a circular steel box, somewhat resembling an overgrown parallel bearing, the diameter of which is some quarter of an inch larger than the axle. This box is "packed" with a number of small rollers of hardened steel ; these completely fill it, just leaving enough room for the axle, which touches every roller, and, in revolving, turns them all. There is perhaps more of one kind of friction with this bearing than there is with any previously described, as the motion of the axle amongst the rollers - imparts to each one a motion in the opposite direction; now, as the rollers touch one another, each one imparts to its neighbour a motion opposed to its own, so that there are two forces at work in opposite directions, and consequently much friction, with its inseparable companions, loss of power and wear of material. This is theoretical. In practice they are found to run very easily, on account of the axle working on a moving surface, i.e., when the weight comes on a roller it revolves, and will, as it were, have nothing to do with the axle. They are of more use to heavy riders than to light weights, as therr good qualities are only seen when a great weight is placed upon them. When made very long-say 2 in .-and properly hardened, they run very easily and satisfactorily with very little wear, but the shorter they are the more are they liable to twist, and thus by a cross motion tear and wear away the axle rapidly. To be good they must be made scientifically, of good material, and properly fitted and hardened, otherwise they are worse than useless, and hence to be avoided upon cheap varieties of the tricycle.

The last and most modern type is the
Ball Bearing, in which a number of small steel balls are inserted in the bearing cases instead of rollers, these balls usually running either in grooves or between coned surfaces. In some varieties the balls touch each other as do ordinary rollers, whilst in others they are kept separate by rings or "cages," which latter method-although a producer of friction to a great extent-by keeping the balls from contact with each other, prevents the reverse motion and consequent grinding of the balls. Owing to the various methods of wheel fixings on tricycles, their modifications in accordance therewith are rather numerous, and at the same time difficult of description in classified order. Taking the hollow-axle tricycle carrying wheel first, we find that when fitted with ball bearings they are, as a rule, very simple, slightly conical or grooved recesses being turned in each end of the hub and the balls inserted therein, bearing upon the grooved axle and adjustable in a slight degree by screwing up the outer cap. These enable a wheel to run with very great freedom, as indeed do ball bearings of all kinds. Of this main pattern there are two varieties, viz., Rudge's and Bown's.

In Rudge's Ball Bearing Hub the hollow nave of the hub itself is conical, as also is the end of the axle, upon which a hardened collar is secured some 5 inches from the end. This collar is curved on one side, and the part of the hub around it likewise grooved correspondingly, whilst a screw cap, also grooved, screws up into the hub and makes a bearing for eleven steel balls which are inserted within the hollow formed by the grooves. The extremity of the axle is hollowed out conically and hardened, and a set-pin with male centre screws up on the outside of the hub and keeps the wheel and axle in their places, whilst only having an infinitesimal bearing surface. A locknut keeps the set-pin from loosening.

Bown's " AEolus" Ball Bearing Hub has balls at each end ; both ends are hollowed out and steel lined, whilst the axle goes right through the hub, but dees not touch it at any point. The outer end


BOWN's "æOLUS" BALL BEARING HUB.
of the axle is grooved, whilst the inner end has a worm cut upon it, on which a grooved collar screws, this being provided with a locknut on the outside. Between the grooves, at each end, balls are placed, which take all the wear, and are adjustable by screwing up the loose collar on the inside. A neat cap screws on over the outer end, and keeps all dust from entering. Both these bearings can only be used with wheels which run upon their axles, as do most of the single-driving class; with the majority of double-driving machines in which the wheels revolve with the axle, bearings have to be fitted to the connections between the axle shaft and the frame, and these are necessarily of a different nature, being for the most part very similar to those used upon bicycles, differing of course in their attachment to the frame. The same varieties are also used to take the bearings of the ends of the crank shafts. These are:

Double Balls, in which the cases are constructed in two parts, the upper one-in fork wheels-being a forging solid with the fork, and the lower one secured to it by screws and nuts in side flanges, Both these halves have two semi-circular grooves worked in them, which run completely round and are distant about $\frac{1}{8} \mathrm{in}$. from each other, and the same distance from the outside of the case. The axle has two corresponding grooves turned in it, but rather shallower, and between the axle and bearing-box is inserted a thin cylindrical collar, pierced alternately with ten circular holes, five being immediately between one pair of grooves, and the remaining five corresponding with the other. Into these holes small steel balls are inserted, which by this means are kept in their places and revolve in the grooves.

With cranked axle wheels the cases, commonly, are held by a

double ball bearing.-For Revolving Axles.
bolt and nut on each side, by which means also they are tightened when requisite. The illustration appended represents them as made by the Centaur Cycle Company.

The "Rapid" Double Ball Bearings. As in the ordinary double ball bearing, a doubly grooved collar fits on the axle, and takes the wear, whilst the balls are placed alternately and kept apart by a steel collar. The outer case is made solid and uniform with a hollow lug at the base, and contains the upper and lower halves of the bearing, which are adjusted sideways by two screws, one on each side, and pushed upwards for adjustment by a nut and screw in the bottom lug.

"RAPID" DOUBLE BALL BEARINGS.

Hillman's Ball Bearings in principle are the same as Humber's, but are adjusted in a different manner. The upper or main portion is formed into a wide deep $\boldsymbol{\Omega}$, or in other words is exactly similar to the old tuning-fork type of plain bearings; the bearing halves are fitted to this, and are easily adjustable from the bottom. by a screw, as will be seen by the accompanying woodcuts.


HILLMAN'S ADJUStable ball bearing.
Single Balls are, as the name denotes, placed in a single line ; they are not separated by any collar, but are free to rotate against each other at pleasure. They are placed in grooved cases in either one or two parts, the latter-adjusted as with Humber's bearingbeing the commonest of the unpatented varieties. Of this class we have several varieties; these are:-

Bown's "Æolus" Adjustable Ball Bearing, the construction


BOWN'S "EOLUS" ADJUSTABLE BALL BEARING.
of which will be clearly seen by reference to the accompanying illustrations. A single row of balls is used, twelve in number, and the adjusting power of cones is made use of for adjustment, it being constructed as follows :-On the axle a steel collar is secured, having two wedge-like projections left upon its outer circumference, which thus form together a conical groove in which the balls are placed. The case is separated vertically, and both halves are coned outwards; the outer or adjustment half is provided with a milled edge, and by screwing up this with the fingers the cones are tightened concentrically upon the balls with a great degree of nicety, and the
adjustment plate is prevented from unscrewing by a bracket with a set of teeth, which fit into the indentations on the circumference of the adjusting case.


RUDGE'S UNEQUALLED BALL BEARING.
Rudge's Ball Bearing is almost identical with Bown's. There are fewer balls, of a larger diameter, only eleven being used, thus lessening the friction a little ; the adjustment plate is of steel, and is not milled, but is provided with a small pin, by which it may be turned as required, whilst by splitting the outer case on one side and providing it with a screw and lock-nut working in projecting lugs, a certain amount of side adjustment is obtained in addition to that concentrically, thus making them capable of very great adjustability. In this bearing the cones have slightly concave surfaces, taking more the form of a groove than with Bown's. Both these bearings are used indiscriminately on both bicycles and tricycles-on the former for the driving wheels, on the latter for crank shaft and revolving axles. The next two are exclusively used on the three-wheeler.

Singer's Apollo Ball Bearing, as may be seen by the sketch, is fitted to the long revolving axle of a double-driver. The tube of the frame is turned out at each end and provided with a steel

grooved casing. Balls are placed within the groove and adjusted by a grooved cone screwing up on the axle, and kept from loosening by a screw which passes through a lug on a collar attached to the axle, and into one of a series of holes on the milled collar of the adjusting cone.

Burdess's Patent Ball Bearing is, in reality, a double variety, though it takes a bearing only upon one row. The bearing box in the wheel hub is deep, and the sides are turned with two concentric grooves in them, the inner one corresponding with the groove on the axle. Two sets of balls are used, one set working between and on the top of the other; the whole being packed close together. The object of this arrangement is to prevent the grinding friction of the balls, the intermediate balls transmitting a continuous motion throughout the whole. The smaller varieties of fork wheels, such as steering wheels and very small carrying wheels running in forks, are provided with ball bearings of the single type, and somewhat resembling those used upon the larger hollow-axled wheels, the balls being placed in the recessed hub, and adjusted by a coned pin upon which they run. There is scarcely any difference in their construction, all being very much alike.

Bown's Fork-Wheel Balls are contained in the hub of the wheel, the case or interior of this being flatly coned, and a slightly concave cone also being provided upon the wheel-pin by which they are adjusted as required. The annexed illustrations fully illustrate their construction and mode of adjustment.


SECTION.


ELevatioy. BOWN'S " EOLUS" FORK-WHEEL BALL BEARINGS.
Rudge's Fork-Wheel Balls are very similar, but (as will be seen by the illustration) they work in circular grooves instead of between flatly-coned surfaces.


RUDGE'S FORK-WHEEL BALLS.

The Club Fork-Wheel Balls are also the same in principle, but they have a speciality in a very neat and effective arrangement for the exclusion of dust, the construction of which will be seen clearly by reference to the accompanying illustration of a hub in section.


CLUB DUST-PROOF FORK-WHEEL BALLS.
Having now pretty well run through the category of bearings, we pass on to another subject, and consider

## THE FRAME

in a slight degree. To minutely describe every part of the frame of a tricycle is altogether a different task from doing the same thing in connection with a bicycle, for it is principally in the frame that tricycles differ so much from each other. I shall therefore for the most part leave the shape of the main framework until I come to describe the numerous varieties of the machines themselves, and shall confine my remarks here to those portions of and additions to the main frame which are common to the majority or to several makes of tricycles.

The Frame, generally speaking, is composed in the main of tubing, that being best for the purpose which is made of weldless steel ; this, however, is only used by just the first and largest manufacturers, on account of its expense, and also because the makers of this especial tube will not execute other than very large orders. Notwithstanding this, however, I think I am right in saying that at least nine out of ten of the varieties of this machine are made "entirely" of weldless steel tube-on paper. Some framesnotably that of the original "Salvo "-are made of solid iron and steel, and this when scientifically put together is extremely strong, and will stand a great deal, but is unfortunately heavy, which is a serious objection in these days of half-ounces. In shape the tube frames differ considerably, and it is mainly to this difference that the great diversity of patterns of the tricycle is due, nearly every machine until recently having a different framing. Latterly, however, some little amount of uniformity has taken place in the adoption by several makers of that form of frame first used upon the "Excelsior," "Meteor," and "Triumph " tricycles. This I shall hereafter speak of as

The Hay-Fork Frame, which may be described as being constructed of two tubes, set $T$ shape at right angles to each other, the
longest being bent forwards at the ends for a few inches, and then downwards, the ends being tapered and still having a forward tendency-though this forward tendency is a defect, as a perfect frame of this type should drop down perpendicularly at the ends, or even slope backwards, finishing up with solid slotted end pieces for the adjustment of the pedal shaft, the extremities of which are borne in bearings therein. The wheels are attached in various ways, and at different heights, to short axles projecting from the sides of the curved portion of the frame, to which also are attached the handle supports, \&c. The saddle bar is usually placed at the junction of the two tubes, the second of which-this may be termed the "backbone "-runs straight backwards, sometimes being bent down more or less at the end, finishing off with a socket or centres in connection with the head and forks of the rear rudder-wheel. This is the type of frame used upon nearly all rear-steering machines, the chief differences with the different makers being the amount of curve and lengths of the several portions, some makers also latterly making the back of the body frame straight ("square backed ") instead of curved, building it in separate pieces for the greater rigidity of the double tyre brake.

The Loop Frame is another style now used by several makers. It is the typical form of frame for a double-driving front steerer of the regular plan, and may be described as a long piece of tubing bent round with more or less curve, so as to form a loop having parallel sides; the curved portion being placed near the ground, from which the sides rise upwards in a curve of varying sharpness to the axle, or to a point a few inches above it, where a second and horizontal tube unites the two ends and holds the seat rod and the wheel bearings. From the centre of the loop formed by the first tube a short backbone ascends, taking the curve of the front or steering wheel, and terminating in a socket or centre working upon the fork of the front wheel. One or more "tails" are usually with this style of frame attached to the horizontal upper part; these being tubes curved slightly backwards running to within a few inches of the ground, and terminating in a small wheel or roller. The purpose of the backstay is to prevent the rider overbalancing backwards, as with this class of frame the weight is placed almost entirely over the driving wheels. When one stay is used it is placed centrally, or at one side, but when in the former position is rather in the way when walking and pushing the machine, consequently two are used by some makers, lighter in construction and placed one on each side.

The T Frame is a form which has become rather more generally used of late for front steering tricycles. It consists of two tubes joined T -wise, the longer one dropping down in a hollow curve to carry the pedals, and then rising over the steering wheel, whilst the cross tube carries the seat rod and rests on bearings at its ends, through which the axle runs.

All other varieties of tricycle frames differ muchly, and for the better description thereof hereafter I give in detail a few of the parts entering into their construction. These are :-

Forks, which are used on all tricycles, chiefly upon the steering and smaller carrying wheels, and occasionally-as in the bicyclepattern tricycles-also upon the larger driving-wheels. They are the upright bars on each side of the wheel which support the end of the frame, and by which the wheel is turned. They consist for the small wheels of plain iron bars, some rin. wide, and $\frac{3}{8}$ in. thick, being $\frac{1}{4} \mathrm{in}$. wider at the top than the bottom. Latterly, however, it having been found that most strength is required at the top, just above the wheel, and very little at the axle, where they are attached to the bearings, they are made thickest and widest at that part, gradually tapering downwards until they reach the bearings; the edges are also made thin-almost sharp-all the thickness and strength being in the centre where it is most required. Those manufactured thus are known as

Bayonet Forks, and are light, strong, and handsome. Some machines have forks somewhat between these and the old style. When forks are used upon the driving wheels, they are, of course, much larger in dimensions than their smaller namesakes, and are moreover necessarily quite straight, whereas the forks of the smaller wheels often curve more or less at the bottom.

Hollow Forks are chiefly used upon the larger fork-wheels, and are constructed of steel tubes, first tapered and then flattened; in many makes the edges are rounded, whilst in others the tube is fluted or indented centrally-and in my opinion these are the strongestbut most makers now bring them to almost as fine an edge as the bayonet solid fork, which of course makes them much neater in appearance. Their advantages over solid forks are that they are lighter and far more rigid, i.e., that they do not give and bend so much when any strain is put upon them, consequently the bearings are not so liable to be crossed upon the axle, and hill work is renderea easier ; also being hollow, they are quite in accordance with the wellknown mechanical fact, that hollow metal under certain conditions is stronger than the same area of solid. Immediately connected with the forks is the

Head, by which that portion of the machine connecting and surmounting the forks is known. Of this there are two or three varieties, that very commonly used for the smaller wheels-and for them only -being

The Socket Head, in which the forks unite just above the wheel, and from the centre of their junction arises a thick rounded pin, tapering gradually upwards, the top being provided with a worm and fitted with a nut. Over this pin, and closely fitting it, is placed a deep cylindrical collar, or socket and neck, to which the frame end is secured. The objections to this mode of steering are that, there being much friction, it the sooner wears loose and shaky, in which
case there is no means of adjustment for wear. It is liable to fasten or stick from getting heated with the friction, or from being without sufficient oil, thus preventing the guidance of the machine. It is very dirty, as the oil, working out from the edges of the socket, runs down the sides of the forks, and is from them transferred to the garments of the rider. The points in favour of it are, that it is neat in appearance, and in general, strong. It is also simple, and possesses an advantage on the tricycle which is considered the opposite on a bicycle, viz., that it allows the wheel to be turned completely round, thus making a smaller circle. This kind of steering is unique in principle as well as construction, all other patterns being upon quite a different principle, and of two varieties, the first being
The Open Centre Head, deriving its name from the principle on which it works. Described roughly, the forks, instead of being united immediately above the wheel are continued upwards in a straight line to the handles of bicycle pattern tricycles, or form a high arch over small steering wheels; at the place of their former union they are connected by a bar or bridge of iron, and at the top the forks are again connected by another bridge. On the lower bridge, at its central point, is either a concave cone or raised centre (or point), and in the centre of the upper one a worm is cut, through which a set-screw works, carrying either a centre or inverted cone at its end; between these the end of the frame. is held, the " spindle" of which consists of a straight pin, having a raised or depressed centre at either end, as the case may be. By means of the set-screw, the steering can be tightened or slackened at will, and the whole secured by the use of a locknut on the top of the upper bridge. Much diversity of opinion exists as to whether the lower centre should be on the bridge or on the spindle; both have their good and bad points, the chief of which are, that by having it on the bridge, i.e., raised, no grit or dust can get in, and so soak up the oil and wear the centre away; in opposition to this, by having it on the spindle-which I think the: better plan-the centres are kept better oiled, as the oil is contained in the concavity, and a greater distance obtained between the centres, by which means greater strength and rigidity are gained, consequently less wear. Regarding the upper centre, by having it on the spindle itself, great rigidity is obtained, and the dust cannot get in ; but the oil is retained better by having it on the set-screw pointing downwards. Still, as all the weight rests on the bottom centre, it is that one which most requires constant lubrication. The advantages possessed by this principle are that, working on centres, very little friction is caused, and what there is can easily be compensated for by simply adjusting the set-screw. It never fastens or sets, very little oil is required, and that does not work out and so soil the clothes of the rider, unless too much is used.
The Stanley, or Closed Centre Head, is by far the neatest in use, and is now the general favourite for both large and small wheels. In reality it is a combination of the best points of the other two
classes, having the neat appearance of the socket steering, and at the same time working on the centre principle, consequently possessing its advantages. In its original and simple form it is constructed as follows:-The forks unite above the wheel, as in the first described plan, and proceed upwards cylindrically, tapering slightly from the base to the top. It thus in outward appearance much resembles the socket. In the back part of the "barrel" a slot is cut and the interior hollowed out; into this the spindle of the backbone is placed, and is adjusted by means of the set-screw and nut as before described. As in the ordinary centre-steering the neck of the frame or backbone is nearly a square of rin. sides, it will be seen that some alteration is requisite here, or it would be impossible to turn the machine sufficiently; to effect this the neck is flattened out vertically to some $\frac{1}{4} \mathrm{in}$. in thickness, and, to keep the requisite strength, is made some 2 in . to 3 in . deep; this enables the wheel to be turned with equal facility with the open-fronted or ordinary centre-steering gear, besides adding greatly to its appearance. This kind of steering is, perhaps, scarcely so strong as either the open front or the socket.

The Backbone, as used on bicycle pattern tricycles, and on the front part of the frames of front-steering loop-framed machines, is constructed of hollow steel or iron, the reason being that, by mechanical laws, hollow metal, under certain conditions, is far stronger than solid, as well as considerably lighter. The best, strongest and lightest are of steel, and should taper gracefully to the connection with the framing, keeping at an equal distance from the wheel for about one-fifth of its circumference. Before leaving the subject of the frame proper to enquire into the various additional items which go to complete the finished tricycle, it will be well to review the several

## NARROWING ARRANGEMENTS

which have been lately introduced for the greater convenience of persons whose houses are not of the most commodious description, or whose doorways were built before the use of the tricycle was contemplated, which said inconveniences oftentimes quite preclude the use of the tricycle to many would-be riders. Of course of the various methods lately introduced, and from which the purchasing tricyclist has to select, he will base his choice firstly on the dimensions it is necessary for the tricycle to be reduced to in order to pass the portals of his domicile ; and next he will consider which of those machines fulfilling the desired requisite in this respect, combine in the highest degree firmness and rigidity when in running order, and will also take into consideration the simplicity of arrangement, the ease and rapidity with which the operation of narrowing and restoring to a usable condition can be performed, whilst he will not forget a glance at the number of loose parts (liable to be lost) which have to be removed; and last but not least will think of the cleanliness of the operation, and pin
his faith to the machine most meeting with his views in other respects. which has the least amount of manipulation of greasy chains and other dirty parts to be gone through in the process of transformation. In examining into the several methods before our notice, I shall divide them under three headings, viz., dividers, folders, and those: of a telescopic nature; and taking the first class as being the older plan, find

Taking off the Wheels to be a method by which all singledriving rear-steerers of the hay-fork framed or "Meteor" type can be narrowed from their normal width of some 36 in . or 39 in . to about 29 in . or 32 in . In machines of this class the loose carrying wheel runs on the end of a short axle, the other end of which passes through a long, stout lug attached to the frame, and is secured by a nut on the inside of the frame. To detach the wheel, therefore, all that has to be done is to take off the securing nut, when the wheel with its axle comes bodily oft, and may be trundled off indoors, to be followed by the rest of the machine. Care must be taken not to lose the securing nut, and also to see that it is screwed up tightly on putting together again, or the wheel may come off when least expected. It will be also found advisable to provide a stand on which to rest the frame when making the separation. One or two machines which are driven by means of gear wheels, instead of chains, can have both wheels removed in this way, as with gear wheels there is no chain to tumble about and be in the way.

Lee and Stodart's Patent effects the same for balance-geared front steerers. The wheel farthest from the gear-box is the one: removable. Machines of this class have this wheel fast on a long axle running in bearings attached to the frame. In this patent the axle $\boldsymbol{A}$ is cut in two, forming a wedge-shaped joint. The steel collar on which the balls of the bearing run is made much longer than usuai, being about 3 in. long. This is brazed to the main length of the axle, and as will be seen by the illustration, has a


LEE AND STODART'S PATENT.
thread cut on its outer end. The short end of the axle bearing the wheel is provided with a threaded collar and rim. A milled nut, $D$, bearing against the rim, screws on to the thread on the bearing collar, and draws the two parts tightly together, whilst a check-nut, E, working on the threaded collar, makes all secure. Both nut and check-nut are attachments to the axle, and cannot be lost; and if a support for the free end of the frame be provided, the detachment is easily, quickly, and cleanly made, whilst the joint is firm and rigid. The width is reduced to about $29 \frac{1}{2}$ in.

The Rapid Divisible Frame is of the hay-fork variety, the fore, or body part, being divided just a little on one side the junction with the backbone. As will be seen by the illustration, a very coarse thread (3) is cut on a collar fixed on the main part of the frame ; the

other portion fits into a socket and is held secure by a nut with milled edge (2), which is a permanent attachment so cannot come off. On unscrewing this nut one half of the frame with its attached wheel can be removed with the crank-shaft which draws out of its taper bearing (4) at the far end. The connection is strong and the operation performed speedily, and with a fair amount of cleanliness. The width is reduced to 24 in .

The Leicester Frame is in the main of the $\mathbf{T}$ variety, the cross tube carrying the balance gear and driving wheels; a square frame is carried up and forwards and carries the brake, as well as serving as a rest for the arms and a steadier to the steering gear. The frame is made to fold, or rather twist, in such a way that when the wheels are both taken off, the frame and fore wheel occupies but a very small space. I cannot do better than describe the operation of folding in the words of the makers, who say :-

Stand at the back of the machine and (r) slacken the set screw and draw out the rod supporting the saddle, placing it in the holder at
the end of the backbone, to keep it out of the way while folding ; (2) unscrew the union joint, and with a jeri from below, sever the coninection between the upright tube and the safety bar ; (3) slacken the thumbscrew, draw up the collar which it serves to tighten, and, when at the top, give it a slight turn round, which will prevent its falling again; (4) unscrew the wheel nuts, with wrench that fits them (you cannot, of course, stand behind the machine to do this), and as the nuts are firmly screwed up and require considerable force to unscrew, care must be taken not to hurt the hand. The best plan both to unscrew and screw them up, is to put the wrench on so that it stands horizontally, and requires a downward thrust to turn it the way required; then, with the palm of the hand towards the wheel, apply the necessary force with the ball of the thumb, keeping the fingers well away from the spokes When all is unscrewed, stand behind the machine again, and lift one end of the axle, push the wheel off with the hand at top and the foot at bottom, set the axle on the ground and take the other wheel off. The frame is then folded by pulling the safety-bar back to a line with the driving chain, drawing the upright tube (which has the steering handle at the top) round towards the end of the main axle-it will go to either sideand lastly, fold the back leg up close to the chain. It may now be wheeled about with ease in the manner shown in the drawing, one hand being placed on the centre of the steering handle to guide.


WHEELING THE FOLDED MACHINE.

To put the machine into going order again, reverse the above method, and when replacing the wheels, turn them round till they slide on to the squares of the axle, or the nuts will not reach the screws; and finally, screw them up tight.

To fold or unfold the Leicester Safety Tricycle is extremely easy, and the time required about thirty seconds only. The machine is then in three parts; there are no loose screws or nuts that can be lost ; it will occupy a width of about 15 or 16 inches, and will stand conveniently against a wall, thus :


THE LEICESTER SAFETY FOLDED.
This concludes the category of divided frames, and we next come to the second class, or folders, which are by far the most numerous of the three. The oldest method of folding in the market is

The Challenge Folding Arrangement, which is as follows :The backbone in this tricycle is just like that of a bicycle, and attached to it by a stout hinge are a pair of arms which carry the forks bearing the front wheels. Across these arms a curved slotted bar rests, being held in position by a couple of stays from beneath. A stout pin passing through the end of each slot projects from the top of each arm, and is provided with a thumb screw which holds the bar firmly on the arm. By loosening these thumb screws without detaching any parts whatever, and raising the two front wheels off the ground and drawing them together, the width is in a few seconds reduced to 22 in ., and as quickly restored to rigidity.

Starley's Patent Folding Arrangement as applied to the Challenge No. 2, an open fronted rear steering single driver, is really very much on the same principle as the last. In place of the usual hayfork frame the frame is made of two long tubes bent down at one end to take the crank bearings and provide an elbow for the attachment of the wheels, and hinged together by a joint attached to the neck of the steering head. The whole is kept rigid by the crank shaft and a cross-bar which carries the seat, which said cross-bar is in two portions, each working on a hinge on the frame, the juncture of the two portions hinging together, one overlapping the other with a clamp to hold them firm. The crank shaft is also held with a clamp, so that by pulling this up and removing the crank shaft, and then pulling up the second clamp, the two sides and wheels may be drawn together to a width of 22 in . It is firm and has fairly few parts, though the wheels do not set parallel when folded. In taking out the crank shaft of this machine one has not to soil one's fingers with the chain, as this is not removed from the lower chain wheel, which remains intact.

In Markham's Champion Folder the arrangement is identical, but the cross bar which carries the seat and serv s as a stay is in one piece. It is hinged to one side the frame, and by undoing the other, and swivelling the bar, the width may after the removal of the cranks be reduced to i2in. only.

The Cheylesmore Folding Gear is applied to a rear-steering two chain machine. The frame is of the hayfork type, save that the fore part is cut off a foot on each side the centre, and a couple of angles or elbows pointing inwards fittel to form junctions between the main frame and the fore parts, which drop almost perpendicularly downwards. The cranks, bearings, and lower chain wheels fit into slides at the frame ends, and by a sharp, upward movement, are removed bodily from the machine, which can then be reduced to a width of 27 in . by raising the wheels, and drawing them together, the elbow slides keeping the wheels parallel, so that it runs as well folded as open. It is perfectly safe and rigid when in action, and is quickly folded, though the chains have to be handled when getting ready for u e.

Fletcher's Patent, as applied to the "Excelsior," consists in making the hayfork-style frame with a square centre, i.e., the two sides are connected by a brace of cross tubes, the seat being supported on the foremost of them. This square frame is hinged at each angle save one, where a $\mathbb{T}$ pin unites the joints and keeps the whole rigid. The machine is driven by gear wheels, so there are no chains to get in the way, and the crank bearings are hinged to the frame ends. All that has to be done in folding is to take out the $\boldsymbol{T}$ pin, and then lifting one wheel from the ground draw it firmly forwards, when the whole frame will shut up and the machine be reduced to a total width of 2 in . only. The reverse motion puts it ready for use again, the gear-wheels falling automatically into gear with each other, and the insertion of the pin making all firm. It is a very neat, rapid, and effective method.

Alldridge's Patent pertains also to this class, though bearing some resemblance to the next variety. The hay-fork frame is made with a square back, the cross bar being square in section, and the side pieces secured to its ends by spring knobs. No chains are used, as the machine drives direct. The cranks are made to "unship," and by taking out these, lifting the two spring knobs and drawing together, the cross bar slides through the sockets in the frame side ends, and the machine is reduced to a width of zoin. The next three are more particularly telescopic in principle. All three are driven with central gear and have frames of the $\mathbb{T}$ variety, the closing movement being different in each case.

Hickling's Telescopic Arrangement consists in making the cross axle hollow, and fitting the wheels on to solid axle pieces which fit inside this; thus by slackening a set-pin at each end, the wheels can each be pushed inwards some six inches, reducing width to 3 rin. The method is easy and clean.

Stassen's Method is perhaps the most ingenious of the whole lot : in place of the single cross tube of the frame two are used, one above and forward of the axle, the other below it. Both these and the axle are of large diameter and are telescopic, the parts on the left side of the seat-pillar sliding into the other side. The interior of
the axle is fitted with a screw, and a small nut in connection therewith is fixed at the outside of the hub of the left hand driving wheel. A small winch handle, resembling the key of a large clock, fits on this nut, and by lifting the wheel off the ground, and turning this handle the frame is closed together to a width of 28 in . A reverse motion restores the machine to its normal width, and the action is at the same time neat, rapid, clean, and very strong and rigid when in use.

The Nottingham Telesco-ic Axle brings us to the last of the closers. Like the last the left-hand portion of the axle is telescopic and slides within the rest, being kept in driving connection therewith by a long broad feather or key. When extended it is kept firm in position by a split tube placed between the end of the enclosing tube and the hub, the whole being secured by a coned jambing nut, which is drawn tight by a milled ring. By loosening this nut and removing the split tube the wheel can be drawn in and the width reduced to 2 gin. in a very clean and speedy manner. All these methods are used for reducing the width of tricycles for use by a single person; there are besides several double machines which can be converted into single ones at pleasure and so be reduced in width, but I shall not consider them here.

From the main-framing and backbone we come to

## THE SPRING,

Which is a very important part of a machine, for a bad spring renders riding extremely uncomfortable and unpleasant, sometimes even painful, a result too often set down as the fault of the machine itself, which consequently gets blamed for it. The desiderata in a spring are that it should be pliant, according to the weight of the rider-a spring pliant under I3st. would be terrifically stiff under 8st.-should be neat in appearance, simple in construction, and as free from complication as possible. There are many varieties of springs. Taking those used upon the bicycle pattern tricycles first, they will be found to consist of a length of flat spring-steel slightly curving, and forked in front, in order to fit on each side of the neck of the backbone, to which a bolt makes all secure. Pliability is obtained by means of the flexibility of the steel muchly supplemented by a slide at the back, which is so fitted that whilst kept in close connection with the backbone, the spring is enabled to slide up and down the same ad lib., and yield to the varying pressure applied.

The Humber Spring is much upon the same lines as the rest, but in place of curving and sliding at the back it is perfectly flat, and supported at the forked rear end by a coil of steel, one end of which is fastened to the backbone, and the other-after curling over twiceholds a short rod upon the ends of which the forked spring-tail works. It is of course very easy and comfortable.

With the more typical pattern of three-wheeler, springs are of several kinds, and a great difference is made according to the nature
of the seat used, for whereas a saddle only requires a single and central spring, a cushioned seat necessitates several, as it must-as a rule--be supported on both sides, and also at either or both the back and front, since not only is pliancy desired, but steadiness and equality of motion. Of these several kinds of spring I shali describe the chief differences in the spring simple, and beginning at the beginning commence with

The C Spring, which consists simply of a length of spring steel bent over once so as to form a sort of hook or flattened C, perhaps more resembling the letter $U$ laid on its side. The sides are unequal ; the top one being the longest, and the under one usually secured to the top of a 12 in . perpendicular rod, provided with a worm upon the greater part of its length for purposes of adjustment. This kind is well adapted for use with the tricycle saddle.


C SPRING AND SUPPORT.
The B Spring is composed of two part circles of spring steel, secured to the ends of a 12 in . horizontal rod, and supporting the seat at their tops; the said rod being generally either a firm fixture to the frame of the tricycle, or mounted upon a rod adjustable either by pin or screw.

The S Spring, as may be imagined, resembles the letter of that name, being in fact very much like two of the previously described C type, the strip of steel being bent in the form of the letter $\mathbf{S}$.

The M Spring is constructed of sheet steel with three angles fore and aft, so as to give an equal amount of spring at each end, and to secure a long flat level top on which to secure the saddle. It resembles in side view two M's placed base to base thus $\Sigma 3$.

Elliptical Springs are formed of two strips of steel of the same length, united at their ends, and curved slightly outwards from each other, thus forming together a sharp-edged ellipse of considerable pliancy. The centre of one side of this is usually attached to the top of an adjustable rod as with the $\mathbf{C}$ class, and the saddle secured
on the top. Sometimes the sides are very much bowed, so much so, in short, as to make the complete spring assume a very nearly circular form. Placed fore and aft of the machine this type of spring is used with a saddle, and by turning it round at right angles to this position it is adapted for use with one or another of the: various kinds of seat.


The Premier Elliptical Spring has its chief peculiarity in its. mode of construction, the ends of the upper half being turned overto hold the ends of the lower one, thus doing away with all pin joints, which may work loose or even give way with a heavy strain..

The Club Spring resembles an elliptical one, with the exception that the front ends are cut off and united by a buffer of india-rubber, the upper portion bearing, by its means, upon the lower, and thus utilising the pliability of both steel and rubber. This is for use with saddles.

The Special Club Spring, for use with seats, is on the same main principle, but is triple in form, the two front ends being supported on rubber cushions, and the rear arm being a fixture.

The Triple Spring is somewhat the same, being a combination of three springs of the $C$ variety, one placed centrally in the rear of the seat, and connected at the seat rod to the middle portion of the other twu, which support each a corner of the front portion of the: seat. This is a very easy and pliant type.

The Cheylesmore Suspension Spring is of this variety; the spring, however, is in two parts, top and bottom ; the ends of the lower portion curve sharply upwards, and support the upper ends of stout rubber links, the lower ends of which support in turn the upper portions of the spring, which are curved round in a half coil. By this, rubber insulation is obtained, and a luxurious seat the result.

The Special Salvo Spring is very elegant and highly pliant ; it consists of a long piece of spring steel curved centrally as for an elliptical spring, but having the ends each brought round underneath almost in a circle, finishing up some 12 in . apart, and secured tothe under side of the ends of a second short steel strip, to the centre: of which is attached the supporting and adjustment rod. It is placed cross-wise to the machine when a seat is secured to its top, and at rigtht angles to this position when a saddle is used.

Settle's Fleet Spring is a very neat construction. Both upper and lower portions are flat and parallel, whilst the ends form very'
nearly circles. This gives a pliant spring, without any sharp angles to break off with undue strain.

Combination Springs consist of several assorted strips of steel, each slightly curved and placed one within or upon the other, all being united centrally. This variety is identical with that used upon many carriages, railway engines, \&c., only of course constructed upon a much reduced scale, and is not only strong, but pliant and pleasing to the eye.

The Centaur Suspended Seat Springs are constructed with two combination springs. One of these is suspended, with its convex side upwards, from two leather straps in the front of the frame. The other-convex side downwards-supports the back of the seat upon its upturned ends, the front portion being upheld by a perpendicular rod passing through the centre of the first spring. The hindmost spring is supported centrally upon a flat slotted bar, secured by a nut to the back of the frame. This gives a very easy seat and admits of great adjustability, being capable of being raised and lowered to any extent ; the front and back also being adjusted sepasately from each other, by which means the rider can tilt his seat either forward or backward ad lib., and so suit himself to a nicety.

The Arab Cradle Saddle Spring is a great favourite, and certainly deserves the title of the King of Springs, for it is superior to most in the market on all points. As will be seen from the accompanying sketch, it is formed of a length of specially prepared round


THE CRADLE SADDLE SPRING.
steel bent doubly over, and turned in a complete curl at each bend, the two ends being held by grippers to the top of the seat rod.

The Arab Cradle Seat Spring is upon precisely the same principle, but to meet the exigencies of the case, the sides are some 10 inches or 12 inches apart, and the ends held by a couple of stout bars set at right angles to the wheels. Both these are very easy and comfortable, giving to the inequalities of the road in almost every direction. Several makers have taken to fitting seats upon the saddle spring (No. 3) instead of the proper seat spring, but as this class of spring was never meant to carry a seat it never is a

the Cradle seat spring.
success, and I strongly advise all who are going in for a seat to refuse to have it fitted with a saddle spring, and see that the proper seat spring is supplied, or they will be disappointed with the results.

Burdesss Patent Lever Spring. Upon suitable supports a couple of rods are hinged at about their centres. The ends of these are connected to ensure firmness, and the front portion kept down by a couple of stout springs, the seat resting upon the rear portion, the consequence being that a very easy undulating motion is given, as well as a very slight sway, the weight being supported by the coil springs in front. The handles, too, in this plan are attached to the sides of the spring frame, and hence the vibration to the hands prevented at the same time to a great extent.
Jean's Triple Helical Spring. In this a triangular frame forms the top of the seat rod, the apex of the triangle being in front. The saddle is attached to this by means of three strong coiled springs, by which it is suspended from the several corners of the frame.

Phillips' Patent Springs consist of two lengths of stout steel placed parallel with each other, and enclosing between them a long strip of spring steel coiled five or six times. The lower supporting bar holds a connection to the seat rod, whilst the upper has a raised length of spring on which to fasten and adjust the saddle.

The St. George's Spring is a very easy one. A cross rod is attached to the top of the seat rod, and from the ends of this two springs depend, curving forwards first and then rounding downwards backwards, upwards and again forwards to a point an inch or two above and in front of the first cross rod, where they are united by a second rod on which the saddle or seat is secured.

Leather Suspenders are used upon one or two machines, whereby combination and arch springs are suspended from the main frame of the machine. They are simply short straps of stout strong leather, and serve to break the metallic connection between the machine and the seat, as well as having a certain amount of elasticity and preventing rattle or squeaking.

Of attachments to the spring seat and seat rod, there are several, all having an object in their construction.
The " $\Gamma$ Pin," or Adjustable Seat Rod, is simple in the extreme. A stout rod is bent at right angles slightly out of its
centre, and the longer end placed in the socket on the frame, the saddle being secured to the other portion. This allows of great universal adjustment either up, down, forwards, or backwards, to suit all tastes and purposes, above all allowing the saddle or seat to be brought well over the pedals. No machine on which a saddle is used is perfect without one of these seat pins.

Jones's Sliding Arrangement. In this the saddle fits on a flat plate having four slots or notches cut upon one side. The saddle is provided with a catch fitting either of these notches, and holding it in place. By a press upon the catch the saddle may be brought well forward for hill work and the level, or shifted six inches back for descending steep hills in safety.

Jones's Roller Atttachment may be described as follows :The saddle, in place of being bolted direct to the spring, rests upon a cross-shaped iron plate, the longer arms of which are turned up at their ends and bolted to a hinge running lengthways beneath the saddle. The shorter arms support rubber pads, the result of this arrangement being that the saddle tilts slightly forwards and to whichever side the rider leans, enabling him the better to reach and throw his weight upon his pedals, as well as somewhat preventing soreness.

The Leader automatically adjustable Seat Rod was one of the 1882 novelties, and is a very good thing in its way. The seat has a stout worm cut upon it, and upon this, just above the frame, a small neat toothed wheel works; a second toothed wheel of equal size is attached to the handle on the left-hand side of the machine, and the two are geared together by a chain. By turning the handle the seat can be raised or lowered at pleasure whilst in the saddle, and a most accurate fit obtained at any moment, as occasion or inclination requires.

The Devon Swing Frame is one of the best things in principle I have come across for a long time. The crank shaft has its bearings in a frame, the sides of which are hinged to the top sides of the main frame, and then unite in arch form. The seat rod is placed at the summit of the arch, and from this point a rod runs back to the rear portion of the main frame in the form of an arc, the under side of which is fitted with a ratchet; a catch holds this ratchet by any of its teeth. This catch is connected with a lever attached to a pull-up handle placed within the bow of the left-hand spade purchase handle. By pulling this up the swing frame is released, and the rider, by pulling or pushing at the handles, can bring the saddle forwards, and the pedals backwards, simultaneously, or vice versa, to almost any extent, and when in the desired position by releasing the handle, the frame is held firmly there by the ratchet. This allows the rider to alter the position of the seat to suit the gradients over which he may be travelling, so as to always keep himself in a position almost vertically over the pedals.

The Excelsior Adjustment is attached to an ordinary elliptical spring, or rather the spring is attached to it. At the the top of the seat-rod is a hinge, and on each side of the hinge is a screw and nut. The spring is attached to the hinge, and may, by slackening one screw and tightening the other, be adjusted so as to bring the pitch or angle of the saddle or seat forward or backward to any desired degree.

From the spring and its attachments to

## THE SEAT

is but a step, and that very essential and useful portion of the tricycle next comes under consideration. Now seats generally, and those which I shall hereafter mention as "cushioned seats," are very simple, being but a wooden board with angular or rounded back, the whole resting on the spring or springs, and provided both back and seat with cushions, upholstered according to taste. The front parts or edges of some seats are plain, but the majority have them scalloped or hollowed out on each side the centre to allow of the freer play of the legs. These cushioned seats are most suitable for ladies and for elderly and heavy men, as well as for those tricycles in which the feet are more in front than beneath the rider. They are now, however, more the exception than the rule, and are little used except on cheap machines, having been cut out by the various patented and special varieties, of which there are several.

The Pan or "Otto" Seat is a great improvement upon the ordinary wooden supports for the cushion. It consists of a sheet of thin steel " blocked" into shape, so as to give a yielding, hollowed, light frame, upon which to support a specially constructed cushion, which is-as are most others-secured by straps.


THE PAN OR " OTTO" SEAT.
Lamplugh's Pan Seat is just the same as this, but the seat is "built on" to the frame, and the annoyance of the cushion slipping. off, or back, prevented. Cushions are at times insufferably hot, they are also continually getting back and allowing the rider to sit on the wooden frame alone. There are, however, several seats of some merit which do not use cushions at all.


THE SUSPENSION SEAT, WITH RAIL.
The Tricycle Suspension Seat, introduced by Messrs. Lamplugh and Brown, is "built" upon the principle of their well-known "Suspension" saddle, and consists of a good broad frame of somewhat semi-circular shape, of the required size for providing a good seat. From the centre of this frame an arm projects forwards, the whole much resembling the Roman letter $\mathbf{E}$. This central arm rises slightly at the end, and is there padded, as is also the outward edge of the frame itself. The whole is then covered with webbing, and leather stretched across. It forms a most comfortable seat, fitting the body wonderfully, and the hollowed sides give to the pressure of the rider's legs, and so avoid chafing, whilst a series of eyelet holes serve for ventilation, and prevent discomfort that way. A supporting bar runs across the frame, provided with nuts and bolts for securing it to the spring. A plated back-rail is sometimes added, as shown in the cut; whilst for those who desire it a raised edge or roll of padded hogskin-which, however, is not of much use in


SUSPENSION SEAT, WITH ROLL.
practice, though very taking in theory-is fitted at the back for the lower extremity of the spine to bear against.

Robinson's Patent Strap Seat, as will be seen by the cut, consists of a light metal frame, having two stout leather straps stretched across, and united by a third for the seat, and another braced across the rear portion to form a back. The straps readily


ROBINSON'S PATENT STRAP SEAT.
give to the pressure and shape of the body, and the space between them allows of full ventilation, and thus obtains a cool seat.

The Excelsior Seat is a great improvement upon the ordinary cushioned seat in many ways. Constructed of bars of steam-bent hard but light wood, it is not angular at any spot, but is so shaped as to take almost the natural shape of the body, receding slightly from the centre of the front, which rises somewhat above the surrounding parts, and curving comfortably round the sides and back. Being thus so smoothly shaped no cushion is required, and the interstices between the bars allowing the free passage of the air, a very cool seat is obtained.

Hancock's Tricycle-seat Air Cushion is made of india-rubber to fit the pan seat, and may be inflated with air at will. In general shape it resembles the usual cushion for this class of seat, but has a long hole centrally, and two smaller round ones, one on each side of the first, to provide for ventilation.

Lamplugh's Suspension Tricycle Saddle is constructed of best pig-skin leather, upon the suspension principle, the leather being stretched upon a long-necked scallop-shaped frame of metal, and being suspended from the front and two sides of the back,


Laxplugh's suspension tricycle saddle, with back rest. by which; means the sides yield to the pressure of the thighs, and all chafing is obviated. In size this special saddle is large, giving " something to sit upon " in the true sense of the word, being
fully twice as large in superficial area as the ordinary bicycle saddle. It is also made in various sizes, to suit individual requirements, and I may here remark that if anyone who cannot get suited with a seat or saddle will communicate with Messrs. Lamplugh \& Brown, they will put themselves to no end of trouble to suit his special case. In addition to its speciality as to size, it is provided with a T -shaped padded back-rest with which to obtain a purchase in hill work and against the wind, which back may be removed or fitted at pleasure. The saddle is far superior to the seat upon those tricycles where the body is placed well over the pedals, and in machines of the bicycle pattern with the rider sitting astride the driving-wheel, is absolutely necessary.

Brooks' Flexible Saddle is about the same size as the last, but built on a different principle. It is constructed with a very soft leather covering and has flexible sides, the whole saddle being padded throughout so as to make it soft and pliant everywhere. It is very soft to sit on but rather inclined to heat, although punched for ventilation, and the peak is made too rounded to be comfortable-at least such is my experience. A back rest, detachable at will, is fitted as shown in the sketch.

Lamplugh's Long-distance Saddle, though especially suitable for bicyclists, is now being used a great deal by tricycle riders. It forms a medium between the bicycle and tricycle suspension saddles, and consists of the frame of a tricycle saddle, over which is stretched a covering of strong leather without any padding, and having a

longitudinal aperture down the centre for free ventilation. There is little doubt that so far this saddle is the most suitable, not only for young riders, but for elderly men, and even ladies, and it is a very extensive favourite.

The Centaur Shifting Saddle. This is an attachment to Lamplugh's Long-distance Saddle, and is used in conjunction with an $\mathbf{I}$ spring as shown in the sketch. The saddle itself is fixed upon a joint working upon two hinged arms, each $\frac{1}{2} \frac{1}{2}$ in. long, the whole being fixed to an oblong frame with pins and nuts, as with ordinary saddles, for securing to the spring. These arms are kept forwards flat on the spring by a powerful concealed spring in their interior. By leaning forward slightly, the front of the saddle is depressed a little and a purchase gained on the arms; a backward

the centaur shifting saddle, $M$ spring, and 7 Pin.
pressure with the thighs then forces them back, causing their ends to describe semicircles of 3 in . diameter, of course shifting the saddle back that distance. By raising the body again, the saddle is once more brought forward by means of the springs. The object of this is to enable the rider to bring himself into a vertical position when ascending hills, and to shift back when on the level or descending hills as desired. Another arrangement attaining the same end is

Jones' Sliding Saddle, in which the top of the spring is provided with four notches into which a spring attached to the saddle block drops. By pressing the spring and pushing back with the thighs, or pulling forwards the saddle-which slides upon the spring-it can be fixed in one of four positions at will according to the gradient or the will of the rider.

In Woolley's Spring Saddle, the saddle itself, an ordinary plain one, is secured to the top of an inverted spring, the tail end working in a "Stanley slide" at the back of the saddle. This makes, as it were, a double spring, and is very useful in a rough part of the country, especially with heavy weights, and is especially adapted for use with a spring too stiff for comfortable riding with the ordinary saddle. This is now also made with "flexible sides," which prevent in a great measure the chafing of the thighs.

woolley's spring saddle.
Besides seats and saddles all tricycles in common have

## HANDLES,

which are of several different patterns as regards both the handle rod and the handle itself, which latter are of three shapes, viz., Spherical, Pear-shaped and Elliptical, the last two being those most generally in use. The spherical and pear-shaped are always fitted to the end of a straight or curved rod as the case may be, whilst the
elliptical are always fitted in a small fork large enough to admit of the hand's taking a firm grasp of the handle, the complete handle and fork being known as the "spade handle" pattern. Handles serve three uses, the first to steer with, their arrangement for which purpose I shall separately treat upon presently ; the second to apply the brake, upon which I shall also descant further on, and thirdly, as a means of steadying the body and obtaining a purchase with the arms when any exertion is requisite. These latter are usually placed on the left hand side of the rider; and are, when of the pear-shaped pattern, fixed at the end of a short, straight or curved rod, either horizontally or at an angle of from $30^{\circ}$ to $45^{\circ}$ with the horizon, in order that the hand may fall naturally upon it when ready for action ; and when of the spade handle variety, are affixed in a perpendicular position, by the side of the rider and ready to his hand.

The Victor Celluloid Handles are an American invention, and are at present only used in that country. They are white, like ivory, and being moulded, and not restricted to the size of a bullock's horn, are made large and bulbous so as to give a larger and more comfortable grip to the hands.

Kelsey's Ventilated Handles are made in both the pear and elliptical forms. They are constructed of steel, blocked into shape, and are made with longitudinal bars, as shown in the illustrations.


KELSEY'S VENTILATED HANDLES.
They are beautifully cool to the hand, the air having free access to all parts, whilst they can be fitted by anyone to any handle-bar in a few minutes; are cheap, and being plated, set off a machine wonderfully in appearance.

Adjustable Hancles. All handles should be made adjustable, and not a few of the best machines are now so fitted, although but a year ago it was the exception rather than the rule. The object of adjustability is to fit the length of the rider's arm, so that whilst not having to lean down to reach the handles he shall not ride with a bent elbow, but have all the advantage of the direct pull of a straight arm, and be comfortably positioned at the same time. Of course it requires but a very little perception to see that if the handles are fixed at one immoveable height the shifting of the saddle will alter the relative position of each, and again should they in any one position suit one individual rider it is by no means likely that they will suit every one, for it is a well-known fact that individuals differ most astonishingly, some having longer legs than others in proportion to their arms, and vice versa. There are now several ways of making the handles adjustable, the most general way being by means of a
set-screw and socket, the purchase handle being simply fitted in a barrel slide and held at any point by a screw, whilst the steeringhandle is attached either to a rod or tube sliding up and down either in or upon the rod or tube attached to the steering mechanism, and held in position in the same way. Of the special varieties of individual makes I may mention

The Cheylesmore Adjustable Handles, which are held in position by a set screw at the side, but have the bow of the handle running up on each side the supporting rod for some 6 in . before spreading out for the reception of the hand.

The Excelsior Adjustable Handles slide up and down within a split tube, which latter is provided with lugs, through which a screw passes, by which means the sides of the tube are drawn together, and the handle rod gripped tightly and held in position.

The Premier Adjustable Handles are very deep in the "bow" -they are of the spade variety-the top of the supporting rod has a worm cut upon it, and a screw at top and bottom of the handle socket holds all firm. It is absolutely secure against slipping, but takes rather longer to adjust, as the two nuts have both to be loosened and tightened before the adjustment is complete.

The Merlin Instantaneously Adjustable Handles. These strike out a new line in being instantaneously adjustable to any position whilst the machone is in motion, so that they can be lowered for hill work where a good pull with the arms is requisite, or raised at will into a more comfortable position. The handles are of $D$ section, and slide up and down in sockets, and a number of shallow holes are sunk in the flat face into which a pin is forced by a spring, and the handle held firm. A button is provided on the the inside of the frame, and, as in the Merlin the legs move vertically up and down, the calf of the leg is pressed outwards against this button in its descent, releasing the catch pin, and the handle being pulled or pushed at the same time, the adjustment is made at the instant, the catch pin flying into its place and holding the handle rod firm.

The Meteor Adjustable Handles, as used on the "Sociable" of that ilk, are curved rods holding the handles and attached to the rear part of the seat with which they are adjustable, so that the act of raising or lowering the seat does tre same for the handles, without, however, allowing for any adjustment to suit the varying proportions between the arms and legs of individuals.

From handles proper and purchase rods, we naturally pass on to

## STEERING GEAR,

which require special attention, as they differ so widely from each other, and play such an important part in the success or otherwise of the machine in toto. Commencing with the machines with central driving wheels or the bicycle pattern, these are steered by means of a

Bicycle Handle, in which very little difference exists. It con-
sists of a bar of iron or steel some 24 in . in length, secured to the top of the head, surmounting the forks between which the wheel works. A fixed handle-bar is best where possible, as in ascending hills or racing a firm hold on the handles is taken, and revolving ones turn and oblige a little inconvenient wrist play; some makers fit their handles with cones at each end of the bracket, by which means a revolving handle may be kept adjusted, as with much use they soon work loose. In some heads the handles are made separate, in others they form a forging solid with it, but although by this latter means they are superlatively firm, they are rather awkward to straighten when bent. Most handles are solid; but they are occasionally made of hollow weldless steel tubing, by which a few ounces in weight is saved and the handle rendered a little stiffer. I think, however, they should always be made solid, as they are the parts most commonly bent in a fall, and a tube is rather a difficult matter to straighten, in most cases a new one being requisite

The Nottingham Folding Handle is of this pattern and is, of course, on the bicycle principle, and the folding is effected by a simple jaw and centre joint, like the legs and arms of penny dolls, or more properly like the handles of parasols used to be made to fold, a cylinder slipping over the juncture and making the whole rigid. The cylinder has four milled rings on its outer surface, whilst its inner face as well as the handle bar at the joint are very slightly coned so that it can be twisted up in an instant very tight, and as quickly undore. With this class of steering, several tricycles, which are not exactly of the bicycle pattern, are fitted, the steering arrangement differing slightly in detail, the most noticeable of these being as follows:

The Greyhound Steering. In this an upright is placed in front of the rider, surmounted by a cross handle or bicycle handle bar. The bottom of the upright is provided with a pair of short projecting pins or arms, one on each side, which arms are connected by light connecting rods with a similar pair of side arms placed one on each side of the steering head. By this method, as the arms are short, every motion of the steering bar is conveyed to the rudderwheel, and a very sensitive steering obtained, the rudder-wheel at the same time being very firm, as being held on each side it cannot " budge an inch " unless moved by the rider.

The Leicester Thumb Steering.-A safety bar runs across the machine at about the height of the rider's chest, as will be seen by reference to the illustration.


IHE LEICESTER THUMB STEERING.

Centrally from this a rod drops perpendicularly downwards, having a $\mathbf{T}$ piece at its top, which is provided with a small upturned handle at each end. These handles, being held by either thumb and pushed forwards or drawn back by them, turn the rod, and through it the steering wheel. This steering is very "nice," and can be kept very firm. These last two methods differ from the regular bicycle pattern of steering in that the small wheels are actuated for steering purposes instead of the large one, and this plan is that adopted by the vast majority of tricycles on the market, the small wheels either in front or behind being the rudder wheels, and the steering gear is in connection with these. The first method to be described, because both the simplest and most ancient, is

The Bath Chair Handle, consisting simply of a straight or curved rod running backwards from the centre of the steering (front) wheel and ending in either a pear-shaped handle or a $\mathbf{T}$ pattern wooden handle, by which means the guiding wheel is turned to the right or left as requisite. The objections to its use are that the arms-if central-have to be kept in an awkward and uncomfortable position, and that little, if any, purchase is obtainable by the arms from the handles, and that also the attention has to be more rigidly affixed to the wheel than with other patterns, as, if the rider turns about-to look behind for instance-and the steering handle, as it naturally would, gets out of the straight, "why, you're into the ditch before you know where you are." On the other hand it may be said in its favour that the eye and hand work more in unison, and whilst the attention is given to it, more accurate steering is obtainable, and also that by turning it either round or over it serves as a most convenient handle with which to pull the machine along when walking with it.

The Velociman Steering is a modification of this plan. As in this particular machine both hands are kept busy in propulsion, the steering wheel is behind, and the end of the steering rod formed into a semi-circular back-rest. Steering is accomplished by the rider turning his body in the direction he wishes to go, which has the effect of putting the steering in motion and turning the machine.

The steering gear in greatest use and favour at present is
The Rack and Pinion Steering, in which a long rod is fitted horizontally from the end of a short arm attached to the head of the steering wheel or wheels to some inches beyond a point immediately below the hand of the rider. One end of this rod is jointed to a short arm projecting from the side of the head or fork of the steering wheel, whilst the other is provided with a "rack" or row of teeth gearing into similar teeth upon a small wheel fitted at the lower end of a perpendicular rod, which rod is held in a socket, the latter being provided with a spring clutch or guide, to keep the rack and pinion wheel together. The top of this upright rod forks out into a "spade" handle, by turning which the long rod is moved by the rack and pinion to and fro as required, by that means governing the direction
of the steering. The advantages of this method are that the steering is steadier, that the hand is in a better and more natural position, that it can also be used as a handle by which to obtain a purchase with the arms, that the steering may be effected by a slight turn of the wrist, that it is not so much in the way of the rider, and is at the same time neater in appearance. Double tricycles are sometimes. steered by means of a

Quadrant Rack and Pinion Wheel, for which method, as the: steering wheel is usually in the centre, a quadrant shaped rack is fitted horizontally to the rear of the rudder head ; this gears with and is worked to and fro by, a pinion wheel at the end of a long straight. rod, which, held in bearings or sockets top and bottom, runs straight up from the head to the handle height, there terminating in the usual " spade" handle.

Stassen's Steering Gear. The machine to which this is. applied having central gear the steering arm is placed central, so as to have nothing whatever to shut the rider in in front. To effect this a rod is pivotted beneath the frame on the right side of the machine, one end of which is hinged to the steering rod, and the other provided with a quadrant rack with which a pinion on the handle gears, and thus puts the steering wheel in motion. It is neat, out of the way, and effective.

Somewhat simpler and very similar to the rack and pinion steering is the

Rod and Arms, in which the rack and pinion is replaced by a short arm of a length equalling that at the side of the head, fitted to the side of and at right angles to the bottom of the handle rod, by which medium motion is conveyed to the rudder and the steeringeffected.

The Eccentric Steering. The steering handle has an eccentric at its lower end in place of the pinion wheel, and this works the rudder rod to and fro as required. It is designed to give a steadier helm.

In the Centaur Rigid Steering the rack and pinion is also absent. Upon the shaft of the handle a deep worm is cut, and a block slides up and down, the shaft being so worked by a pin and ball fitting in the groove. This block works in a slot at the end of the horizontal arm of a bent lever, having its fulcrum at the end of a quadrant arm attached to the bottom of the handle-shaft. The other end of the lever is jointed to the rod in connection with the steering wheel. By turning the handle the block is worked up and down, and the wheel so turned. Its chief advantage is its rigidity, allowing the hands to be taken from the steering without fear, if travelling in a straight line.

Burdess' Sterling Steering is on the same principle, the upright handle-support forming a rather close-cut screw which works one end of a bell-crank lever up and down, the other end of the leve being jointed to the fore end of the steering rod.

Lloyd's Quadrant Steering is very peculiar, and differs entirely from any other. There is no back fork or steering head, but the sides of the frame are continued rearwards; these converge until they reach the centre of the rudder-wheel, which is 30 in . in diameter. Here they end in oblong slides curved towards each other so as to form quadrants or quarter circles-whence the name. The wheel axle is long, and runs in bearings which work in these slides. Below the centre of the straight cross tube of the frame a long bar pivots, the ends of which are connected by hinged rods to the extremities of the steering axle. A rack and pinion steering rod actuates one end of the pivotted bar and thus, drawing one end forward and forcing the other back, causes the wheel to turn as desired. This method enables a large steering wheel to be used and the great vibration of a small one obviated, whilst it is claimed to render the steering firmer and more rigid.

All these plans regulate the direction of a single steering wheel, but when two guiding wheels are used a special method has to be adopted, in order that they may accommodate themselves to each other, and turn exactly to the requisite amount, and each in the same direction. The oldest of these plans is

Blood's Patent, in use where the two steering wheels are placed side by side. It is very simple, and consists of a rod running straight back from each fork some i21n. to 18 in., and then united by a third rod bent to a curve at each end. These rods connect the forks of the two wheels, and when one is turned by means of a rack and pinion, the other is also turned, and not only so, but the angle of each is such that both describe arcs of different sized circles, according as they are in or outside in turning, thus avoiding any jumps, scrape, or tyre tearing.

In the Gnat Steering, which is of this class, the two rudder wheels run on the ends of a long rod, which is curved upwards on each side of a Stanley rudder head-affixed to a neck on the end of the frame-very much like the cow-horn handle-bar of a bicycle. A rack and pinion steering rod is hinged to the apex of each bend, and the action of forcing one wheel forwards draws the other back, both hands being bro!ught into action either together or separately. As both these wheels run free they are able to rotate as they please, and safe steering is the result, though the arrangement is not so rigid as it might be.

The Humber Steering is on the plan of the bicycle pattern variety. The two large wheels are placed on the ends of a compound axle, the centre of which is provided with an upright head and bicycle-pattern handles, by which means the wheels are guided in whatever direction it is wished to turn. It is very steady and sensitive when learnt, though it requires some little practice at a slow pace to get thoroughly at home with it.

The Coventry Steering is applied to the machine of that name in which the two steering wheels are placed some 6 ft . apart, and in
a line with one another. These have each a small arm projecting from the fork sides, but these arms are placed upon opposite sides, i.e., one wheel bears the arm on its left, whilst the other holds it on its right fork. These arms are connected by a long straight rod, the centre of which is provided with a rack, by which it gears with a pinion attached to the handle as usual. It will be seen that the motion of this rod moves both wheels, but in opposite directions, so that they both describe arcs of the same circle, be that large or small, the hindmost wheel following exactly in the track of the leader. This enables a very easy, quick and delicate steering to be effected. The slightest turn will alter the course of the machine, but it is much firmer than most other tricycles on account of the steadiness imparted by the use of two rudder wheels. After riding an ordinary rack and pinion steering machine, this steering seems too sensitive, but a very little use will show that the hand has but to be kept firmly on the steering handle and very little steering actually done, the guiding being effected almost by a wish.

The Traveller Triple Steering differs from all others in that all three wheels are used for steering purposes. The two front wheels are turned $\grave{a}$ la "Humber" by means of a bicycle cross handle. To the lower part of the upright holding this a semicircular rack of bevelled teeth is affixed, and in the teeth thereon a small crown wheel works, which crown wheel is attached to one end of a straight rod held in bearings under the backbone beneath which it runs ; the rear-most end of this rod is also provided with a small crown wheel similar to the first, and this gears with a second semi-circular rack affixed to the head of the rear wheel, which is held in a Stanley head and fork. The effect of this is to cause all three wheels to assist in working the steerage, which is rendered extremely quick, accurate and sensitive, whilst the machine is not deflected so much from its line of running.

The helm and its varieties attended to, before looking into brakes and minor accessories and appendages, our attention is claimed by the various types of

## DRIVING GEAR,

Which have all their pros and cons., and may be divided into two general varieties, these being levers and chain wheels, the former necessitating an "up and down" motion of the legs, and the latter a rotary one. Upon the special advantages of each variety I shall not here descant, having already given a full article on the general points of merit of the two methods, but shall content myself with a description of the mechanical construction and points of difference in these arrangements, and their modifications. Commencing then with the oldest plan in use,

Levers are of numerous varieties, and have several modifications, some of them patented in the different machines. The commonest and simplest pattern-of which I shall in future speak when mentioning levers without a generic name-consists of a straight rod
some 2 ft . to 3 ft . in length according to circumstances. This rod has a pedal of the rubber variety as used upon bicycles, fitted at one end, whilst the other is jointed to the lower portion of the frame of the machine, and forms the fulcrum. A double-cranked axle is used which is in connection with the driving wheel or wheels, and is put in motion by adjustable rods or chains, one being attached to a point, about midway usually, on each lever, and united with the arms of the axle. This is generally done by means of a simple hook, but the best connection by a long way is

The Friction Link, which may be described as a broad flat ring encircling the bearing part of the crank, of which it is about three times the diameter. The chain or connecting rod is attached to a small roller which works inside the ring and between it and the axle, there being some little space between them.

The Dublin Levers are very simple indeed; the machine is driven from a central driving wheel provided with cranks, as for a bicycle. To these, long and very light adjustable rods are attached by pins and bearings, their other ends being widely and deeply forked, and jointed to the sides of the tops of forked arms, which have their lower ends socketed to a part of the main frame, large foot-pedals and heel-guards being fitted between the forks. By this means a direct pull upon the cranks is obtained on the leg being advanced in an almost horizontal direction.

In the Challenge Levers the lever itself has its fulcrum some 18 in . from its rearmost end, which is then bent upwards at right angles to the fore part, and is at its top jointed with light rods in connection with the cranks, as with the Dublin pattern, thus the feet by pressing down the pedals draw the tops of the lever arms forwards, which in their turn perform a like action upon the cranks, and so turn the wheel.

The Omnicycle Levers are very short, and hinged to the front portion of the frame. They are curved so as to elevate the pedals, which are placed an inch or two from their hindmost ends, at which point a stout leather strap runs backward to the driving discs, which will be described further on.

Asbury's Levers very much resemble these. They are hinged at one end to the forepart of the frame, and have pedals at the other extremities, from which connecting rods are carried to bearings on a double-cranked axle connecting the wheels. They obtain a straight pull and seem powerful. They are only used on children's. machines.

Overman's Lever is much of the same nature, but has its fulcrum in the rear ; the driving cord is attached some 4 in . from the end, and the lever slotted from this point. In this slot a pedal is adjusted, attached to the end of a short arm which swivels at the attaching nut, and may be turned over in either direction so as to increase or decrease the leverage, as desired or requisite according: to the nature of the gradients.

The Merlin Levers resemble the ones just described, but the pedals are not adjustable. The pedal itself consists of a simple short bar of rubber cemented on a rod.

Grout's Adjustable Levers have their peculiarity in that their point of power or attachment of the chain is adjustable at will whilst running, in order to meet the various requirements of the varying gradients. The levers themselves are of a fixed length, having pedals at one end and working on a hollow fulcrum at the other. Within this hollow fulcrum a rod works provided with a pinion wheel at the junction of each lever. The chain attachments are made to the ends of tubes which slide on the levers, and are each provided with a rack projecting rearwards and gearing with the before-mentioned pinion wheels. A series of short rods, connected by universal joints, unite the lower end of the left purchase handle of the machine with one end of the rod within the fulcrum, and by this means the said rod is rotated, causing the pinion wheels to revolve, and by their means push forward or draw back the racks carrying the chain-juncture, and thus the proportionate amount of leverage applied, with a correspondingly proportionate increase or decrease of the length of the stroke taken, which may be altered at will for hill work or the level.

Jeans' Climax Adjustable Levers are identical with the above in principle, the only difference being in the details of working it out. The adjusting racks are carried within the levers, which are tubular, to allow the connecting joint to pass up andodown in a slot, whilst the revolving pinions are turned by an extra handle placed some way behind the rider, and provided with a bevel or crown wheel at the bottom, gearing with a similar one on the end of the pinion rod. The levers too are drawn up and down by a cord or strap passing over a pulley fixed on the frame, whilst in Grout's a balance lever connects the two and does the necessary work.

All these levers are used for pedomotive work, but besides these there are several kinds in use on manumotive or hand-propelled tricycles, which I will briefly describe as follows :-

Hand Levers, as applied to ordinary front or rear-steering tricycles to render them usable by lame persons, consist of a pair of long levers working on fulcra attached to the frame sides, and having a leverage of about three to one. The lower ends are connected by :short rods with a pair of cranks which turn the lower chain wheel, and through that the driving wheel or wheels in the usual way; whilst the upper ends are provided with handles wherewith to move them, that on the right hand lever being usually shaped like that of a gimlet, and fitted with a disc, round which a cord passes to actuate the steering gear.

The Toledo Hand Levers are very similar, but are used to assist the feet, being connected with the sides of a double-cranked pedal shaft, whilst there is a difference also in the steering, which
consists of a rack and pinion, the rack rod running down the face of the lever in place of the cord and pulley.

The Favorite Levers are simply a couple of long cranks turned by hand, and attached to a couple of chain wheels connected with the drivers, and carried on the ends of a couple of tubes, which raise them to the level of the arms.

The Dreadnought Hand Levers are used as an assistance to the feet, and it is wonderful what power can be obtained, though the action appears somewhat eccentric to the observer. The principle is that of utilising all energy, and instead of the rider pulling on a pair of fixed handles he pulls on a pair of handles which work in slides, and are attached by connecting links with a pair of short cranks, placed one at each end of the double-cranked pedal shaft and on the outside of the frame. The effect is to pull up with the arms alternately, whilst the feet push down the corresponding cranks. The steering is done in the ordinary way, as the steering handle is of D section, and slides up and down within the pinion wheel of the steerıng gear.

Charsley's Velociman Levers, though mainly intended for manumotive use, also allow the feet to be employed at the same time, and with this method either limb can be used individually or all collectively, or any combination of the four for driving purposes. A $\perp$ shaped attachment to the backbone of the tricycle (a rearsteerer) forms a fuicrum on which a somewhat triangular frame works, the fore end of which takes the form of a foot-board, whilst to the sides, some six or eight inches from the footboard, a couple of levers are attached. These run parallel with each other straight upwards, and unite with bearings in which work the cranks of a double cranked rod, both cranks being set the same way. From their junction with the crank ends the levers proceed upwards, curving forwards, their upper ends being each provided with two handles, one a little below the other, so as to give two leverages. By pulling these lever handles as in rowing the cranked rod is turned, and by means of a chain wheel at one end turns the balance gear of the driving axle. It is very powerful and easy, and the steering is done by means of the Velociman rudder before described.

Having concluded the category of lever motions, the only other that remains is the

Rotary Motion, which is now the favourite with most, the feet having with it exactly the same rotary or circular method of progression as with the bicycle. The simplest way of effecting this is naturally by means of ordinary

Cranks and Pedals, which I have duly described upon page 24. Of course these can only be used upon central driving tricycles; or where the rider sits astride the driving wheel.

The Double-cranked Axle has also been previously described (page 25), so I will not repeat. It is used with a few tricycles having two large driving wheels, the rider sitting upon a saddle raised
sufficiently high between them to enable him to reach the pedals comfortably with his feet, at the expense, however, of safety, as the centre of gravity is consequently very much above the centre of motion. A great improvement upon this method is to be found in

The Monarch Stirrup Pedals, these being placed so as to form stirrups hanging some 6 in. below the cranks, which enable the double-cranked axle to be actuated direct, but bring the centre of gravity very considerably lower, whilst they also enable the dead point to be got over almost entirely by bringing the natural play of the foot into action, and thus obtaining a certain amount of forward and backward as well as downward thrust. The most general and most popular way of attaining the rotary motion, however, is by means of a double-cranked pedal shaft, and

Chain Wheels, which are thin skeleton cog wheels, specially constructed for the purpose by having the corners of the teeth bevelled off. One of these wheels is affixed to the driving axle, whilst another is in connection with the crank-shaft, and the two are united by an endless chain, likewise specially constructed for the purpose. These wheels are placed at different distances apart in the different machines, and the chains are tightened upon them by means of slots or other devices in the frame, which allow of the wheels being separated a couple of inches or so to compensate for wear or stretch. When the chain wheels on the axle and crank shaft are of equal size a machine is said to be "geared level," as each complete turn of the cranks produces one complete revolution of the wheels, while when the chain wheel on the driving-wheel is smaller than that on the crank it is spoken of as being " geared up," as one revolution of the cranks will produce more than a complete revolution of the driving-wheel, which will thus be made at each turn of the pedals to travel over as much space as a wheel of much larger diameter. On the other hand, when this is reversed, the chain wheel on the crank-shaft being the smaller the driving wheel revolves less than one complete revolution to each complete turn of the pedals, and it is said, consequently, to be "geared down." On coming to the

Chains themselves we find that there are several varieties on the market. Very few makers manufacture their own chains, chainmaking being a distinct trade. The chains originally used for tricycle driving were constructed of two sides to each link, connected with solid end pieces, but they were found very quickly to wear through and break, consequently they are hardly ever brought into use now, rearly all the best makers using

Reynold's Chain, in which the links are composed of parallel side bars, and are arranged in alternate sets, the ends of the side bars of the narrow links fitting between the ends of the broader ones on each side of it. The ends of the broad links are connected by solid rivets, whilst those of the narrow ones are united by cylindrical end pieces through which the solid rivets of the first pass; thus it will be
seen that instead of the side pieces of the links bearing with comparatively sharp edges on the connecting rivets, the two sets of links work together on a long parallel bearing, and wear is avoided, whilst to reduce the wear from the teeth of the chain wheels to a minimum, further cylinders work on each connection and take the wear as the wheels go round.

Warman's Non-stretching Chains have as their guiding principle the construction of their links in such a manner that the pull or strain shall be taken by the solid link piees instead of by the rivets or connections. As will be seen by the illustrations, each

warman's non-stretching chains.
link forms three sides of a parallelogram, and in the No. r, or leading pattern, two of these are placed back to back, a pin rivetted through the projecting ends, and a single link of the pattern shown in the cut with side shoulders at each end placed alternately between each double link. A chain is thus formed having a number of side pieces projecting at regular intervals. For the use of this chain a special chain wheel is needed, this being formed with two parallel flanges on its periphery. The body of the chain sinks down between the flanges, and the side pieces drop into a series of hollows cut at regular
intervals in these flanges, so that the chain is kept from coming off as well as being stronger. It is made in four patterns, these being different combinations of the two links of which the chain is composed.

Starley's Chain is constructed with two distinct patterns of link, one being like those generally used, having parallel side pieces connected by shoulder pins. These are placed alternately with a solid link, which is broad and of a longitudinal section similar to

the accompanying cut. The connecting pins of the first-class of link pass through holes in the ends of these latter, and so unite the whole chain. A specially constructed chain wheel is used having only half the number of teeth usually fitted, the solid links falling between the teeth, which are short and curved to fit the chain.

Warwick's Patent Driving Bands take the place of chains. They consist of thin steel bands, having studs all round about an inch apart, these studs being supported by separate pieces of thin steel, which take the wear instead of the main band. Special wheels are used with these bands, having no teeth, but a series of holes cut into a smooth periphery at equal distances apart to take the studs. They are very light and neat, and, as now made, I believe strong and effective.

Phillips' Patent Driving Bands are formed of very small wire spirals, intertwined to form a smooth, even, strong, yet very flexible band, intended to drive off smooth leather-covered drums. They are not as yet in use by anyone as a standard pattern.

The Otto Driving Bands are of thin flat steel, and drive off smooth band wheels or drums. They are specially prepared in manufacture, so that they are not very liable to snap. They are the lightest things of the kind in the market.

The Excelsior Wheel Gearing is very similar to the above methods in general features, but for the chain or band is substituted a third wheel, not constructed, however, in the same manner as the others, but more resembling a chain wound round a wheel ; in other words the circumference, in place of teeth, is provided with revolving cylinders just in the same way as the chain. This plan makes the driving gear much firmer, there being none of that delay, if I may so term it, in transmitting the power from one wheel to the other; in addition to which it is safer on the whole than the chain, not being so liable to break or get out of gear. On the cther hand there is a little increase in friction in consideration of the extra bearings of the third wheel. By placing this central wheel behind the other two, these latter are enabled to be brought very close together, so that it does not necessitate the use of a larger driving-wheel.

The "Caroche" Patent Gearing answers the same purpose, and has much the same outward semblance as the preceding one.

The speciality in it, however, exists in the construction of the central wheel, which is composed of two discs so fitted together as to form a grooved circumference with raised flange on each side. At intervals of about I inch around this wheel, bearing-holes are pierced in


THE "CAROCHE" PATENT GEARING.
the two flanges, in which a series of balls, with conical bearings projecting from their sides, work. The teeth upon the other two wheels are rounded so as to roll softly from one ball to another, thus giving less friction, and consequently greater ease of propulsion. The wheel is made in two sections, in order to fit the ball-rollers in their places.

Avis's Patent Wheel Gearing is a multiplying method, and is most simple and neat in construction and action. Upon the extremity of a double cranked pedal shaft a large disc, some 12 in . in diameter, is fitted. This has upon its exterior an overlapping flange, with close cut teeth upon its inner face. Upon the axle of the driving wheel (30in.) a circular toothed wheel some five or six inches in diameter is fitted, and this gears with the teeth upon the flange of the pedal disc, in such a manner that one turn of the pedals causes the driving wheel to move about the same distance as a 50 in . wheel. A neat cap fits in beneath the flange, and shuts the gearing in, so that it appears simply like a broad disc of metal connecting the wheel and pedals.

The Imperial Rob Roy Gear is an improvement on the last or Royal Rob Roy gear, inasmuch as a machine may be geared level,
down, or up at pleasure. An additional gear wheel is used, there being one on both crank and wheel, whilst the internally toothed gear wheel is larger than before and has a toothed flange on each side. This wheel works on bearings on the frame, the lower gear wheel working into it on one side and the upper one on the other. By varying the sizes of these upper and lower wheels the gearing may be arranged as wished, either "up," "down," or "level."

Burdess's Patent Driving Gear, like the Royal Rob Roy, consists of but two $\operatorname{cog}$-wheels; these are placed the one upon the wheel hub, the other upon the crank-shaft, and gear with each other externally. In driving the machine the pedals take the reverse motion to that usually taken by the feet, the rider, as it were, back pedalling to go forwards. This gains two very good points on a rear steering machine. It places the feet and direction of thrust immediately beneath the rider, and also allows pressure to be put upon the pedals without any tendency to tilt the back wheel.

The Orbicycle Gear consists of a shaft running within a tube, which tube is placed between the legs of the rider, and is furrished with an orb or hollow sphere of metal at either end. At the sides of the lower orb a pair of ordinary bicycle cranks are attached to the protruding ends of a short shaft, which carries concealed within the orb a crown or bevel wheel. This crown wheel gears with a similar one on the lower end of the first-mentioned shaft, whilst a duplicate of this is also fitted at the upper end of the shaft which, within the upper orb, gears with a crown wheel attached to a tube enclosing the axle and in connection with a box containing Starley's balance gear (to be described later on) through which the wheels are driven. One of the chief advantages of the chain wheel and wheel gearing is the before mentioned great variation in speed and power which can be obtained at will by its use, for by increasing the diameter of the wheel upon the cranks and decreasing that of the other, speed can be multiplied to any extent, whilst the reverse effects increase of power-though of course loss of speed-in a corresponding degree. One point should be always observed in the manufacture of gear wheels, which is, that no matter how the sizes may be varied, the number of teeth upon one should never be an exact multiple of that upon the other, but should be either one more or less. This distributes the wear over the whole wheel, each of the teeth coming alternately into the position of greatest strain, which would not be the case were the number of teeth on the wheels either equal or a multiple, when consequently one tooth would always present itself at the straining point, and would be quickly worn out, or would very probably snap off after a time. Chain fearing when used for central traction either before or behind is driven by a pair of pedals and cranks fitted to one of the toothed wheels, but when for side driving, the double-cranked pedal shaft is called into requisition. The two following methods of connecting the wheel and pedal-shaft effectually avoid "back-lash," and the annoyance of chains stretching or teeth breaking, though of course a wheel must always be driven direct, and cannot be " geared up " or the reverse.

The Special Zephyr Driving Gear will better be understood by reference to the illustration of the Special Zephyr further on in the book. It is a most ingenious construction ; the crank-shaft end on one side is provided with a short crank, at the end of which is a bearing, and here a second short crank is attached at an angle to the first, with a second bearing at its end. A similar arrangement is attached to the axle of the driving wheel, and the two sets of bearings connected by rods, through which power is imparted.

The Cygnet Gear very much resembles the last, but is somewhat simpler in action. An arm is carried out horizontally on the side of the frame on which the driving wheel runs, and at its end a crank works on a bearing. The crank-shaft end and the wheel axle end are provided with similar cranks, and that on the crank-shaft is connected with the two others by means of rods, one of which serves the purposes of connecting the crank and wheel and driving the machine, while the other keeps the whole steady and prevents a backward motion in place of a forward one when on a dead point.

Like the two last, the next motion necessitates level gearing, though the absence of back-lash is not quite so complete. This is


THE ECLECTIC DRIVING GEAR.

The Eclectic Driving Gear, which is a very ingenious arrangement of shafts and universal joints, though being a new introduction it remains to be proved whether or no it will stand work or easily get out of order. Both chains, bands, and intermediate wheels are done away with. The end of the axle of the (single) driving wheel ends in a fork or jaw, as also does that of the crank-shaft immediately beneath. Two vertical bearings are attached to the back part of the frame, in which a shaft about a foot long works. Each end of this shaft is furnished with a jaw similar to those on the crank and axle ends, and these two pair of jaws are connected by a pair of solid "right angle x" or double-jawed pieces, the jaws of each being bolted to the ends of small $\mathbf{X}$ pieces. Thus the eight jaws revolve as it were one within the other, and rotary motion is conveyed from the crank through the vertical shaft to the wheel axle.

This concludes the category of methods by which power is conveyed from the pedals to the wheels, but besides these plans there are several patent arrangements for gearing the wheels with the driving shaft to effect various objects, and these are more or less worthy of note according to the advantages obtained by their use. I may sub-divide these into two classes, one of which has as its object the simultaneous driving of two wheels, at the same time allowing them to accommodate themselves to their necessarily varying velocity when describing curves, the other aiming to obtain at will one or more rates of speed. Taking the former class first I again sub-divide it into clutch gear and balance gear arrangements, and alternate drivers, in which both wheels are driven, but alternately. Of clutch gear there are a large number of varieties, the principle in each being by the use of some kind of automatic clutch or ratchet to drive both wheels when travelling in a straight line, but to automatically allow the outer wheel to run free in turning and describing curves. With this class the commonest mechanical arrangement brought into requisition is

The Ratchet and Pawl, which title to the mechanical reader will be in itself a sufficient explanation; to those, however, who are unacquainted with it I would explain that upon the axle of the driving-wheel-or on the crank shaft-there is fixed a "ratchet" or set of teeth, all sloping so that a "pawl" or catch attached to the driving gear will bite against the teeth when revolving one way, but will slide over them when revolutions are made in the opposite direction. This arrangement enables both wheels to be driven (by using two chains), allowing at the same time one to revolve faster than the other when requisite, and also allows the wheels to revolve without the pedals, so that these latter may be used as foot-rests in descending hills, in fact in order to drive the machine the feet must tend to move faster than the wheels so as to keep the pawl in gear. This arrangement has one great drawback, and that is, that the machine cannot be driven backwards or checked with the feet, a
manœuvre which, though not frequently performed, is at the same time highly desirable.

Rucker's Automatic Clutch is a very ingenious arrangement. Upon the outer face of the lower chain wheel is a set of rat-trap or serrated teeth. The crank shaft is continued three inches or so beyond this, and has upon its extremity a circular cap fixed, the edges of which are cut into eight or nine long ratchet teeth, and between this and the chain wheel a loose wheel travels having serrated teeth on one side to correspond with those on the chain wheel, and large ratchet teeth on the other exactly fitting those on the driving cap; a space of about half-an-inch is left for the centre wheel to play in. The action is as follows :-When the driving cap is turned by the pedals, the long ratchet teeth drive the central wheel into gear with the serrated teeth on the chain wheel, and so carry all round together, but upon the feet being stopped, their action reversed, or the wheel outrunning the pedals, the centre wheel falls back into its first position and allows the chain wheel to rotate in freedom.

The "Cheylesmore" Gearing is fitted to the pedal cranks. As with the previous one, two driving chains are necessary, one upon each side; these serving to connect in the ordinary way two toothed wheels, fitted, the one upon the axle of the wheel, the other upon the extremity of the double-cranked pedal rod. The lower toothed wheel upon each side forms a shallow box through which the crank end passes, without however coming in contact with it. Upon the crank rod ends caps are fitted, covering in these boxes and shutting up therein metal discs having four portions removed from their circumferences, thus leaving a like number of cavities-circular at one end and angular at the other-between the outer edge of the disc and the inner circumference of the box. In each cavity a steel ball is placed. Upon turning the cranks forwards the wedge-shaped ends of the cavities hold the balls firm and jam them against the box or case, which they force round, and thus communicate power


THE " CHEYLESMORE" GEARING.
to the wheel. Should the wheels run faster than the cranks, or the latter be turned backwards, as in back-pedalling, the balls are brought
into the circular portions of the cavities, where they are free to revolve without contact with the case. By this means both wheels are driven, but either is able, if it so desires, to run faster than its fellow, as in turning corners and curves. The feet also may be kept stationary, and the pedals used as foot-rests when descending hills. Thus far it is of course impossible to back-pedal for any purpose whatever; but, to enable the rider to do so if he chooses, a series of fine teeth, all sloping one way, are cut upon the inner surface of the left-hand gearing box, and a plate, fitted to correspond, provided ; this latter sliding about half an inch upon the pedal rod, may be put in or out of gear at pleasure by means of a small lever in connection with it, which is worked by a handle placed a few inches below, and in front of the left-hand purchase handle.

The Weston Gravity Clutch consists of two triangular jaws or clutches pivotted eccentrically, so that whilst, when the pedals are still they are kept clear by gravity in the recess of the hub to which they are attached, upon motion being given to the pedals they immediately run round and jam against the outer circumference of the chain wheel boss, against which they rest, and by this means draw the wheels round.

Lloyd's Clutch consists of a disc, on one face of which are a series of tapered holes all sloping one way. This disc forms the boss of the lower chain whiel. The crank-end is provided with a second disc, or ring, on which a series of short pins or pawls are hinged in such a way that on the crank being driven forwards they move outwards and into the holes on the chain disc, and thus drive it forwards, whilst, should the wheel move faster than the pedals, the disc overruns the pins as in an ordinary ratchet.

In Thresher and Sims' Clutch a flange is attached to the hub of the wheel, just inside which a small metal gripper works on a pin. The crank shaft in an open front machine, or the axle in a front steerer, has a projecting pin which presses on the small end of the gripper, and on being moved forwards causes the side jaws of the gripper to bite the flange, and so drive the wheel. With this both wheels are driven in all forward running, the pedals are used as footrests, and the outer wheel is free in turning.

The Delta Driving Gear. In this the lower chain wheel runs loose upon the crank shaft, one side of it forming a hollow box which has angular teeth around its inner circumference. Upon the crank shaft a small eccentric is secured, fitting into the hollow part of a catch piece, having one end serrated and pivotted so as just to clear the teeth on the chain wheel box when the eccentric is central, or in other words, when the feet are at rest. Movement of the pedals forward will cause the serrated end of the catch piece to engage with the teeth upon the box, and so drive the machine. The feet are kept at rest when descending hills, and either wheel, by over-running the pedals, can free itself for turning purposes.

The Dutton Driving Gear is peculiar and powerful. A single
toothed wheel engages with that on the driving wheel, and is in its turn actuated by a pawl put in motion by a foot or hand lever; this pawl acts on the near side of the wheel and turns it backwards, each stroke taking it about one-third of a revolution round. The driving. wheel, being geared with this, is thus propelled forwards, and may be multiplied or reduced in speed as desired by altering the size of the toothed wheel on the driver.

The Moss Lever Gear. In this a stout rod runs across the machine, having at its extremities very large spur wheels, which gear, by means of chains, with very small ones on the wheel hubs. On the cross rod are a couple of strong collars or discs, and eccentrically with these a couple of levers are arranged, so that on pressure being applied the collars are "bitten" or gripped, and the rod and its attached wheels drawn round a quarter of a circle or less according to the length of stroke taken. Each lever is fitted with a very strong " mouse trap" spring-i.e. a powerful coil, with one end bearing against the frame, the other against the lever-which draws it up immediately pressure is taken off. The high gearing of the wheels-which are fitted with ratchets for double driving-counterbalances the slow motion of the levers, with which any length of stroke may be taken at will, and either or both feet used at pleasure or kept still if desired, independently of the motion of the wheels.

The Overman Driving Gear has been very much altered since my last edition. It now consists of a disc of metal actuating the axle of each wheel by means of a ratchet, which allows the disc free and separate motion from the axle in a backward direction, but engages with it and drives it round when moved forwards. Around each disc is a deep groove in which a steel cord works, being attached at a point in the periphery of the disc at one end, and the other fastened to the Overman levers before described. Each thrust of the foot draws the axle about three parts of the way round, and as the power is, throughout the whole of the stroke, applied at the same point, viz., that at which the cord leaves the driving disc, full power is obtained throughout the whole stroke. The ratchet motion allows the wheels to run forward by themselves after the stroke has ended, and the disc is drawn back again by a coil spring acting rearwards. As a rule the feet are worked alternately, but if occasion requires they can be worked simultaneously, when this makes one of the most powerful actions known. The two halves of the axle, to each of which one wheel is attached, are united centrally by a double set of serrated teeth, which fit into each other, and so hold the long axie rigidly together, so that both wheels are simultaneously driven when running straight forwards, whilst for turning purposes a lever in connection with the steering wheel is arranged so that it draws the serrated faces apart, and the outer wheel is free to turn as it lists.

Lawson's Patent Clutch Gearing attains the ends of a double driver by means of separate driving chains. Upon the inner side of each lower chain wheel a broad disc is fitted, having a stout flange circumferentially. This flange is held, when at work, by two
broad clutch pieces, which are fixed an inch or so apart upon the end of a lever, so as to fit one upon each side of the flange, which latter is provided with a pear-shaped hollow centre, through which the axle passes. Upon the crank-shaft is a small pin, which, when the shaft is turned forwards, throws and keeps the large end of the lever forwards, by which means the two clutch pieces at its other extremity are brought cross-wise against the outer and inner sides of the flange, which they thus clutch firmly and drag round after them, thus turning the wheel. Should either wheel tend to outrun the motion of the axle, the disc-flange runs through the pieces freely. This allows the outer wheel to turn faster than the inner one when necessary. Upon the pedals being kept stationary the pin working the clutch is held upright and the clutch pieces are free from the flanges, thus allowing each wheel to run free and the pedals to be used as foot-rests, whilst upon back pedalling the action of the pin is reversed, causing the pieces to clutch the flanges in the opposite direction, thus effecting the desired end. This last allows the machine to be driven both backwards as well as forwards, which the previously described ones do not, whilst at the same time they allow the feet to be kept stationary when descending hills.

The Pilot Reversing Clutch consists of a set of small $\mathbf{T}$ shaped handles arranged around the driving box, each of which can be turned round with the fingers by its $\boldsymbol{T}$ head, when it drops down and brings a pawl into gear with a reversed set of ratchet teeth, and thus enables a machine to be driven backwards if occasion requires.

The Golightly Stopping Clutch is a small lever having a point or catch at its inner end, and which can by the outer handle be brought to bear against a set of teeth on the hub of the wheel, to prevent the machine from running backwards when coming to a stop during the ascent of steep inclines.

The Howe Disconnecting Gear is fitted to a single-driving tricycle for the purpose of throwing the driving-wheel out of gear, so that the pedals may remain stationary and be used as footrests when descending hills. It consists of a simple lever and pin, and a loose chain-wheel: the latter being on the wheel axle. The lever has its fulcrum on a bracket on the frame side, and a few inches above this it holds the connecting pin, whilst the top, just below the handle, fits into a holder with two points of station attached to the left purchase handle of the machine. By moving the lever from one to the other of these station points the pin is drawn out so as to free the hub from the chain-wheel, or pushed in so as to gear them together again when required. The remaining actions of this class will drive either backwards or forwards, but will not allow intermittent strokes to be taken or the feet to be kept stationary when descending hills without separate action. They are as follows :-

The Triumph Driving Clutch is applied to an equal-wheeled open fronted machine, having two chains, one upon each side, one
chain to each wheel. One of the wheels runs ordinarily loose upon its axle, and has a milled wheel attached upon the inner side, a similar wheel to which is attached to the axle of the toothed chainwheel. These two milled wheels run side by side, and a third but smaller one fixed to the end of a lever gears with the two. When in gear for straight running both wheels are driven, but for turning. or riding amongst traffic it must be put out of gear, when the machine drives as an ordinary single-driving machine. Of course if one forgets to put it out of gear, turning is impossible.

The Nonsuch Driving Clutch is identical with the above, but the connecting cog-wheel is placed on the end of a lever jointed to and actuated by the front end of the steering rod. The one I saw at the Stanley Show was very loosely constructed, and shaky.

The Greyhound Double Driving Gear. In this the chain driving gear is placed centrally and actuates a chain wheel on the centre of a cross axle, which is divided into two parts, one side being fast to one wheel and the other to the other. To each part just by the side of the chain wheel which separates them, a ratchet wheel is placed, and the chain wheel carries engaging pawls on each side, so that the one chain drives both ratchets and both wheels, whilst either wheel with its ratchet may, if it so wills, outrun the pawl which drives it when going round curves. One half of the axle is slightly telescopic to receive the end of the other and give it some stability. Both wheels are driven, and the pedals remain stationary when descending hills.

Lawson's Coned Driving Clutch is provided for the purpose of making the loose wheel of an open fronted tricycle drive when travelling straight, and to throw it out of gear when turning. This is effected by a cone upon the band wheel, which is forced into a conical recess in the hub of the loose wheel by a powerful spring. The steering handle has a $\mathbf{D}$ shaped piece of metal at its base, and when running straight allows the clutch to remain in, but the act of turning forces the clutch back, and the wheel is left free. Somewhat of a similar nature to this is

Weatherill's Driving Motion, in which an open-fronted tricycle is driven direct by a double-cranked axle, to each end of which is fitted a cone, behind which is a strong spiral spring, which forces the cone into a recess coned to receive it in the hub of the wheel next it. These cones are attached to levers which run up the sides of the flat-sided hay-fork frame, and are at their tops attached to the end of twisted or screw rods, which pass through the straight back of the frame. Acting on these screws are a couple of levers, which are both fitted side by side on the left of the rider, and form a handle. By pushing this bodily forwards both screws are acted upon so as to push outward the tops of both levers, which has the effect of drawing out both cones and releasing the pedals from the wheels, which are allowed to run free, whilst the pedals are used as footrests. A still more forward pressure of the
levers presses discs on to the brake drums, and serves as a brake. These coned clutches drive both wheels equaily either forwards or backwards, and give just sufficiently to allow slight curves to be made in ordinary running, while for turning, one or other of the two halves of the left purchase handle has to be moved forward to release the outer wheel. The only objection to this method is that a separate action of the hand and head is required in order to turn, which is apt to be slow or be forgotten when in a hurry.

The Weston Serrated Clutch is the same as the Nationa!, but instead of a jamming cone a rat-trapped plate is kept in gear with a similar set of teeth on the hub, the plate being put in and out of gear by a D on the steering handle actuating a lever as before.

The Wolseley Double-Driving Gear. In this both wheels are driven rigidly when travelling either forwards or backwards in a straight line, there being two chains attached to chain wheels fast to the axles, on which the wheels run loosely, but are held firm with it by means of sliding keys. A couple of rods run across the frame at the rear, and these being actuated by the steering handle push against the end of a lever attached to the sliding key and force it out of action, thus causing the wheel so treated to be freed from the axle and turning rendered practicable. By pulling a $X$ handle upwards both rods are pushed in opposite directions and both wheels freed, the pedals being then used as footrests for descending hills.

Of the alternate drivers at present there is but one in the market, this being

The Merlin Driving Gear, which is somewhat upon the same principle as that of the Overman. In it the Merlin levers are used, and to these are attached broad leather straps, which are fastened to and pass round small drums which revolve on the axie of each driving-wheel and carry a couple of stout pawls or catches. The straps make two complete turns around the drums, so that one complete stroke of the lever gives two complete revolutions of the ${ }^{\circ}$ wheel, which is in this case but 3 oin. in diameter. The wheel axle passes through these drums, and has a ratchet just outside each, with which the pawls engage on the forward motion and run over on the return without any noise whatever, this latter being effected by means of a small piece of leather which deadens all sound. A couple of springs attached at one end to the rear portion of the frame, and at the other to cords which pass round the drums, serve to draw them back for action when the stroke is completed. With this motion the length of stroke can be varied at will', the rider taking short or long ones just as it pleases him. Of course neither will it back-pedal nor go backwards, which is the only objectionable point about it. These complete the first sets, and we now come to the last type, viz., balance-gear arrangements, the first of which is

Starley's Patent Transmitting Balance Gear, which is constructed thus:-The main shaft connecting the two large driving
wheels is made telescopic, one fitting inside the other. The wheel upon the right hand side of the machine has, attached to the face of the hub upon the inner side, a cog-wheel with a bevelled face, and the main shaft of this wheel departs centrally from it and runs inside the shaft of the other. Upon the extremity of the tubular shaft of the left hand driving wheel a similar bevelled cog-wheel is affixed so as to face the first, and be distant from it about an inch and a half. Between these two bevelled wheels, and working loosely upon the shaft of the right hand wheel, is a collar forming the centre of a toothed chain wheel, similar to those used for ordinary chain gearing. A straight rod departs radially from the central collar to the circumference of this chain wheel, and upon the end of this


STARLEY'S TRANSMITTING BALANCE GEAR.
nearest the circumference a small loose cog-wheel works, which has its face so bevelled as to fit and gear with the other two. The chain wheel is geared with a second one, attached to the pedals in the usual manner. Now the power is imparted from the centre of the third or pinion wheel, and as this point is the centre of a circle, the distance therefrom to all circumferential points, or in other words to the bearing surfaces of the cogs, is equal ; and consequently if the centre of the pinion is moved forward, equal power is imparted to the bevelled wheels at each side of the pinion, and through them to the driving wheels. Here we have the true "Balance of Power." As soon, however, as the course of the machine is, by the steering wheel, deflected from a true line, an inclination to stop or revolve at a slower rate is thereby imparted to the inner wheel, with the result that the pinion immediately moves over the face of the bevel wheel
connected with it, thus forcing the outer wheel round at a greater rate of speed; the inner wheel acting for the nonce as a fulcrum to a lever, which has the object to be moved at its other end, and the power applied in the middle. To perhaps more clearly illustrate its action, I may refer to the balance bar of a pair of scales, in which we have an equal armed lever supported at its fulcrum, placed of course centrally. So long as equal weight-or power-is applied to each arm of the balance, so long will each be raised equally by raising the fulcrum ; place, however, the smallest additional weight in either of the scales, and the result of raising the centre will be to cause the other or lighter arm to ascend to a far greater height than the first. Although differing in construction muchly from each other, the action of all the following balance gear is precisely similar, driving both wheels on the straight, and the outer one mainly in turning, allowing the proper curve to be taken without any drag, hitch, or jump of either of the wheels. Thus it will be seen that it drives either one or both wheels as required, and it can also be driven backwards with equal facility. The gearing is kept boxed up in a neat metal covering to prevent the entrance of dust and grit.

In the Humber Gearing the pedals are attached to bicycle-pattern cranks, fastened to each side of a toothed wheel, connected by an endless chain with a second wheel upon the centre of a long axle. This axle, like the last, is telescopic, the toothed wheel being attached to the outer one, at the end of which is a gun-metal bell-shaped box, fitted close to the left-hand wheel. This box encloses two bevelled wheels, one a fixture to the left hand wheel, and the other to the end of the inner axle, to which is connected the right hand driver. From two opposite points of the case or box, short pins depend radially, each bearing a small bevel wheel, gearing with the two larger ones. Thus power is transmitted from the feet to the outer axle, and from this to the bell-shaped box, which, by means of the smaller bevel wheels and pins, imparts power and motion to the driving wheels as required.

Settle's Patent Balance Gear is also identical in general contour with Starley's, but in place of bevelled teeth the pinion has upon it a set of equ:-distant hemi-spherical projections, whilst the side wheels have hemi-spherical cavities into which these fit. It requires to be made very accurately, and when complete is fully satisfactory in action, the gear running very smoothly together.

The Diana Balance Gear, like the previous ones, consists of two side wheels and a pinion. On the peripheries of each of these, small holes are sunk at regular intervals, and an endless chain is passed around both side wheels and, crossing above them, on each side the pinion wheel. This acts effectually, the only question as to its efficiency being that of the strength of the chain.

Pritchard's Balance Gear is very neat and close, being about


PRITCHARD'S BALANCE GEAR.
the neatest and most compact in the market. A long, but in this case simple, axle runs across the machine, connecting the two wheels. The driving chain is upon the left-hand side of the machine, and connected in the usual way, and a broad disc is attached firmly to the hub of the left-hand wheel, which disc has upon its outer side a wide circumferential flange, with teeth upon its inner surface, the smooth exterior being used for the application of a band brake. This wheel runs loosely upon the end of the axle, the left-hand drivingwheel, has bolted upon it a toothed wheel some 2 in . less in diameter than the interior of the larger one, into the hollow of which it fits, whilst a third and very small toothed wheel, its teeth corresponding in pitch with those of the other two, works loosely upon a stud fitted to the arm of the chain wheel, and just gears with each. The whole arrangement shuts up "flush" in a very compact and neat manner, no additional covering being required.

Kirby's Patent Balance Gear, like the last, is built with level faced wheels. With it a double pinion is used, or rather one having two diameters, the larger of which is the same multiple of the larger internally toothed driving wheel, as the smaller is of the externally toothed wheel. Both gear wheels fit very closely, and the pinion is held on the chain wheel, which runs loose at the side, as in Pritchard's patent.

In Hillman's Patent Double Driving Gear two wheels and two pinions are used, all with straight teeth. A toothed-wheel is in connection with each driving-wheel, and over all a neat box fits, covering them in, and giving a broad brake surface, as well as being one with the chain wheel; upon the inner side of the chain-wheel, within the box, two stout pins project parallel with each other, and on each of these a long pinion is fitted, each of which gears with one of the wheels, whilst they gear with each other centrally, and so transmit motion and power as required.

The Victor Gear resembles the last in almost every respect, the chief difference being that the gear wheels and pinions are made with bevelled teeth.

Markham's Balance Gear, like the two last, has two parallel faced $\operatorname{cog}$ wheels close to and by the side of each other, and each in connection with a wheel. These are driven by a couple of pinions attached to the chain wheel, and are thus driven straight forwards equally, or the power passed on to the outer wheel in turning or taking curves.

The National Differential Axle differs very much from any of the others in construction, but is none the less effective. It is a most ingenious affair, and is beautifully made. The gearing is contained in an elliptical box placed centrally, and turned through a tube, to which it is attached by the chain wheel placed at the side. The axle is in two parts, and the accompanying illustration will show its construction clearly, whilst I cannot do better than describe its cetails and actions in the words of the manufacturers, as follows :-


THE NATIONAL DIFTERENIIAL AXLE.
It consists of two shafts of equal length, A A (on which the driving wheels are secured), kept in line by the sleeves B B, and communicating with each other by the short shafts C C, on which are fixed the spur pinions D D. The short shafts C C, which are placed at an angle of 60 degrees, freely revolve in bearings formed in box E, being connected to the long shafts by :nniversal joints. The box E containing the differential mechanism consists of two parts, connected by screws and check nuts. The chain pulley F is fixed on sleeve B , and receives its motion from the pedal crank. Supposing the machine to be running in a straight line, box E and its enclosed differential mechanism revolve as one solid piece. Upon turning the guiding wheel, the box and sleeves continue revolving at the normal speed, but inasmuch as the small pinions freely roll round each other, the outer wheel and axle move at an increased speed, and the inner wheel and axle at a correspondingly diminished speed. By these means a perfect distribution of power is maintained, and the reciprocating or compensating action produced which renders this machine so effective. The movements of the pinions and of the shafts inside the sleeves take place only when the wheels revolve at different speeds, and are so slight that little or no friction results.

The Weston Double Driving Gear somewhat resembles the "Salvo" and "Humber" gearing in general outline, having also a touch of the nature of the "National" gear. In it the axle is divided centrally, each half being attached to a driving wheel ; the ends are each fitted with an equal sized bevel wheel, and the whole enclosed in a box with cylindrical ends, enclosing the axles as far as the frame sides. To this box are fitted two small bevel pinions facing each other, and gearing with the two main bevel wheels, a pin keeping axles and cylinder in place. The chain wheel is on one end of the enclosing cylinder, and the action of the gearing is the same as that of other balance gear.

All these varieties of the balanced driving gear are only used on front-steering tricycles, and until last season balance-gearing could not be had without front steering. Recently, however, two methods have been introduced for fitting balance-gear to open fronted machines. In

The Royal Mail arrangement a compound axle is fitted some ten or twelve inches behind the wheel axles, which axle is fitted with Starley's balance-gear, and a chain wheel on each end. These chain wheels are geared with other chain wheels attached to the axles of
the driving wheels, and the whole driven by a third chain in connection with the chain-wheel on the crank. This fully effects its purpose, though it adds some weight, and the use of three chains seems rather a roundabout way to get at it. The other method is in reality a balance-geared crank shaft rather than an axle. It is

Rucker's Balance Gear, the crank-shaft itself forming the gearing, which is a perfect balance motion and not a clutch action, although two chains are used. The crank-shaft is made in several pieces, forming a firm and rigid whole. The pedal bearings are hollow, and through each a rod runs, having a small level-faced cog-wheel at each end. A similar, though somewhat larger cogwheel is attached on the inside of the frame to each of the lower chain wheels, and these cog-wheels are severally geared with the outer one on the pedal shaft by another placed between them, working on bearings on what would in ordinary machines be the sides of the shaft. The centre length of the shaft is made in two pieces, between which a set of five small level-faced cog-wheels work, gearing with each other, and the end ones with the inner ones on the pedal shafts. These sets of gear wheels are cased in with a neat light covering. In straightforward or backward running all the gear revolves bodily, but on making curves the gear comes into action, and a very slight movement takes place throughout the whole, causing the outer wheel to be driven on all curves exactly in the same way as an ordinary balance gear. This gearing could be made with half-a-dozen less wheels in its construction, but they would have to be solarge as to interfere with its use, and as there is little friction going on between them, size is reduced by using a larger number, and the whole is as neat and compact as it can well be. It drives equally well backwards as forwards, and has all the advantages of an ordinary balance gear.

This concludes the category of the first class of driving motions, and we now come to the second or varying speed arrangements. Of course, as I have said before, by varying the proportionate sizes of the gear wheels on the axle and crank shaft respectively, a machine may be geared "up" or "down" to any extent, i.e., may be made to travel at a high rate of speed in proportion to the rotation of the cranks, or the cranks may be made to turn at a faster rate than the wheel. With the former plan a machine is said to be "geared for speed," and with the latter "geared for power," the first method being of little use except over level country, whilst by the second plan, by a more rapid movement of the feet, or rather by a slower pace, hills can be ridden with comparative ease. Riders must not, however, think that a machine geared "for power" gives them any power; it does not, for no more power can be applied to the machine than the rider possesses in his own muscular system; it simply, by causing him to propel the machine a shorter distance at each stroke, enables him to do his work like Bruce's spider, " little by little, inch by inch." Now, although machines may be thus geared to any rate of speed, the same rate is not always suit-
able, as a " speeded" machine is no use whatever on coming to hills, whilst a power geared machine is annoyingly slow on the level, and consequently the following " hill-gearing" have been introduced, by which two or more rates of speed may be obtained at will, by turning a handle or some other simple mechanical contrivance.

Warwick's Patent Two-speed Gear. In this the simple expedient is adopted of driving with either wheel as occasion requires, and for this purpose two sizes of gear are used, a large one being on one end of the pedal shaft, and a small one at the other, whilst on the axles this is reversed, the gear wheels running loose therenn, so that by clutches actuated by the left purchase handle either can be thrown into gear with the axle at will, one wheel driving at an increased and the other at a diminished rate of speed compared with that of the pedals, whilst by holding the clutches at an intermediate point neither wheel is in gear, and the pedals may be used as foot-rests. With this patent, Warwick's patent driving bands and band wheels previously described are used.
Jeans' Dual Gearing is on the same principle as the above, but instead of bands or chains-either of which may be used under Warwick's patent--intermediate wheels are used. These are affixed at the ends of levers placed on each side, and connected by a swivelling beam. Each lever has a catch which holds it in the position required, and by pulling this up with the finger and moving the lever backwards or forwards, as the case may be, either wheel is put into gear, the other being at the same time thrown out of gear.


In Gear.


Out of Gear.

JEANS' DUAL HILL GEAR.
The Burdess Hill Gear, like the previous two, drives one wheel for speed, the other for power. In this machine one wheel is fitted with chain gear in the usual way, whilst the other is provided with Burdess's patent back-pedalling wheel gear, the gear wheels on the crank ends being fitted with ratchets arranged to clutch in opposite
directions, so that as one wheel is geared up and the other geared down by pedalling forwards in the usual way, the chain driven wheel is propelled for speed, whilst by reversing the action of the feet the geared wheel is driven for power at hills, whilst the feet may remain stationary at will. Of course back-pedalling, so far as driving the machine backwards or checking the speed with the feet is impossible.

The Rapid Hill Gear, by placing two different sized toothed wheels on one end of the pedal-shaft, and a like number in reversed order upon the axle, brings both speeds to one side of the machine, either of which can be used at will, as two intermediate wheels are used, placed at the two ends of a forked lever-handle, and so arranged that one is put into gear by pressing forward, and the other by the opposite motion. It is very effective, and is made in two proportions, so that I cannot do better, to fully explain its construction and action, than quote the words of the manufacturers with reference to the annexed illustration. They say:-
"We make our patent speed and power gear in two classes. Class i has two 40 in . front wheels, and, for ordinary roads, a 25 spur wheel on crank shaft gears into a 2 I spur wheel on right-hand driving


TEE RAPID HILL GEAR.
wheel, equalling about a 48 in . front wheel in the distance travelled for each revolution of crank. For hill climbing, by simply pushing the lever forward, this is reversed-a 21 on crank shaft gearing into a 25 on driving wheel-thus gaining 20 per cent. extra power, and equalling about a 34 in . front wheel, in the distance travelled for each revolution of crank.-Class 2 , constructed for specially hilly districts, has two 40 in . front wheels, and, for ordinary roads, a 27 spur wheel on crank shaft gears into an i8 on right-hand driving wheel-equalling about a 60 in . front wheel in the distance travelled for each revolution of crank. For hill climbing, by simply pushing the lever forward, this is reversed-an 18 on crank shaft gearing into a 27 on driving wheel-thus gaining forty per cent. extra power, and equa ling about a 27 in . front wheel for each revolution of crank. In othe
words, with 40 in . driving wheels, and geared for ordinary roads, Class i travels about 12 feet, and Class 2 about 15 feet 10 inches; and when geared for climbing hills, Class i travels about 9 feet, and Class 2 about 7 feet respectively for each revolution of crank. This reserve of speed and power is under the most perfect control, and can be brought into play with the utmost ease, at any moment, at the will of the rider." When the reversing lever is in the intermediate position shown in the diagram, the wheels and pedals are out of gear; the pedals forming a rest for the feet when descending hills. To obtain the quick speed, the reversing lever is pulled backwards. To obtain the extra power for hill climbing, the reversing lever is thrown forward.

The Vertical Wheel Gear, by the same firm, is somewhat akin, but is simpler in action and less complicated. As will be seen by the illustration (which shows the gear working for power) a large sliding wheel (3) on the wheel axle, and a small one (ir) on the crank shaft, when geared together by the intermediate wheel (9) have the effect of gearing down for hill work. The intermediate wheel (9) is on the same shaft as the larger one (4), and the two are supported in position on the end of a crank or lever (10), and held in gear by the left purchase handle (2), the shaft of which (8) is held by a lever (I) and catch (7). By releasing the catch and turning the handle completely round and then pressing the handle down the supporting crank or lever is depressed and straightened and the large intermediate wheel brought into gear with the gear-wheel on the axle, which is slid over for that purpose, whilst the smaller one is put in gear with that on the crank shaft and a higher rate of speed obtained, whilst at an intermediate position the pedals are free to revolve and may be used as foot-rests. When geared for speed, the 40 in . travelling wheels are equal to about 54 in . wheels, and when geared for power they are equal to about a 32 in . wheel, in the distance travelled for each revolution of the crank shaft. When changing gear always pedal forward.


The above methods of hill gearing are applicable to single driving machines only, the rest which I am about to describe may be used on single and double driving machines alike. Of these there are really two divisions, viz., those using two chains, which are of course the simplest, though not so neat, and in general somewhat heavier, and the various more or less complicated gearings which transmit different rates of speed through the same chain or gear wheels. Of the former class we have

Soper's Berkshire Hill Gear. The machine to which this is fitted has the chain and driving gear in the centre, and the necessary two speeds are obtained by using two chains and two sizes of chain wheels on both crank and axle, throwing one or the other out of gear with a lever handle as desired.

The Diana Hill Gear is very similar, the gear-box containing the balance gear being fitted with chain wheels of two diameters, and the crank-shaft likewise provided; a chain being used to gear the two sets together, one for speed the other for power, a clutch, actuated by a lever handle, being also provided to throw one in and the other out of gear as required.

Hissett's Patent Ideal Gear is practically the same thing, but with the chains placed on each side the machine. It is constructed as follows:-The axle is enclosed within a tube which runs over its entire length, and through the bearings on each side, one part just inside the bearing, being attached to the outer case of the balance gear box. It will be seen that the turning of this tube will turn the balance gear, and so move the wheels. On each side therefore a chain-wheel runs loosely on the tube, the chain wheels on the two ends being of different diameters, so that one is geared up, the other down. Between each driving wheel and the chain-wheels a sliding clutch is fitted, fast by a feather to the driving tube. A rod runs across the machine and connects these two clutches, so that the action of drawing one out, with a lever attached to the rod, throws the other in, there being also an intermediate point where both chains are free and the pedals open to be used as footrests at option.

The Victoria Two-Speed Gear is on the same lines, two chains being used, one on each side, one geared up and the other down. These are in connection with a through axle, which is fitted at each end with Thresher and Simms's clutch (described on page - ) by which both wheels are driven at either a high or low speed according to the gearing in action at the time, a lever being used as with the last to put one side into action and release the other. From twochain hill gear we pass on now and confront those which provide a double speed with a single chain. These are :

The National Hill Climber, in which a toothed wheel fits on the crank shaft end, just inside of and abutting the lower chain wheel, which for ordinary driving drives direct from the shaft. Upon the end of a lever actuated by a handle, however, is a smaller double toothed wheel with two diameters. By bringing this up
against the other two the small wheel is put into motion by the toothed wheel, and in its turn actuates the chain wheel itself, by the cogs on its other diameter acting upon it in the space left open by the chain, the crank shaft thus driving the chain wheel through the medium of the small intermediate one.

The Zephyr Hill Gear. In this the chain wheel on the crankshaft has fast to it a straight faced cog-wheel, and by its side is a similar one of a slightly different diameter. This second cog-wheel is keyed fast to the crank-shaft, whilst the chain-wheel and its attached cog-wheel runs loosely upon it when not held fast by a sliding clutch. This clutch is in connection with a lever, at the end of which a double cog-wheel is fixed, i.e., one having two diameters. The moving upwards of this lever has the effect of throwing the clutch out of gear with the chain-wheel, and immediately putting this double cog-wheel into gear with the two others, so that in ordinary driving the chain-wheel being keyed fast to the crank by the sliding clutch revolves without any additional friction, just in fact as any other machine ; whilst for hill work the power is transmitted to the chain wheel through the double cog-wheel, which is so arratged as to produce a slower speed. By altering the proportionate diameters of the different cog-wheels the gearing up or down may je done to any degree.

Singer's Challenge Two-speed Gear consists of the same parts as Starley's balance gear, viz., two bevelled cog-wheels face each other on the same shaft with a bevelled pinion working on an arm of the chain wheel between them. By locking the two main wheel; of the gearing, the pinion and chain wheel are carried round at the same speed as the pedals, but by locking one wheel to the frame, the other being fast to the crank, the pinion wheel is caused to rotate over the face of the fixed wheel, and the machine thus geared down to any desired degree according to the relative proportions of the diameters of the bevelled wheels and the pinion.

Harvey and Paddock's Hill Gear, Britain's Hill Gear, and the Crypto-Dynamic Hill Gear are all identical in principle and general features, so I will describe the gearing used in all, as the several details of the special methods of application used in each are not yet sufficiently settled in manufacture to render a description accuate. Neither are yet on the market, but Britain's is expected to be ready for delivery early in May, whilst the other two may be a month later. The mechanism used by each is identical in parts with Pritchard's balance gear, illustrated on page 83, an internally and an externally toothed-wheel being geared together by pinions placed between them, the chief difference being that whereas Harvey and Paddock use two pinions Britain uses three, and the Cryptodyıamic contains four. In all the internally toothed-wheel forms a pat of the chain wheel on the crank shaft, and by means of sliding clitches either the externally toothed-wheel or the arms carrying the pinions is put into gear with the crank shaft, the effect leing to
alter the speed of the machine according to the proportion of the gearing. These gears seem to be right in principle, neat, not liable to get out of order, and effective, and will, doubtless, have a great future, when the several details and proportions are fairly worked out and placed on the market in a commercial manner.

The rest of these gearings convey power to the wheels without chains of any kind. They are

The Moss Five-Speed Gear. In this two conical drums are provided of equal size, the surfaces of which are cut with five circles of hemispherical hollows or teeth, a series of grooves crossing these in a helical manner round the drums. These drums are affixed in the reverse direction to each other, one on the crank-shaft, the other on the wheel axle, and between the two a light frame is fixed, on which an intermediate wheel works. This has teeth cut so as to engage with those on the surfaces of the drums, gearing the large end of one with the small end of the other. The helical groves allow this intermediate wheel on being pressed with a lever to shift from one line of teeth to the other, the surfaces of the drums being paraliel with each other, and by this means a machine may be geared level by having the gear-wheel central, or it may be geared fither up or down at two rates of speed at will. It appears strons and effective, though it is rather cumbrous and roomy, in appearance

The Orbicycle Two-Speed Gear somewhat resembles the Burdess in mode of action. On the tube which encloses the axle and which carries the Starley's balance-gear, two different sized crown-wheels are fitted in the centre, within the orb described in connection with the Orbicycle driving gear (page ). These crown wheels are fitted with opposite acting ratchets, and are both in gear with the crown wheels on the top of the driving shaft, the action of turning which rotates one crown wheel one way, and the other the other, so that by simply reversing the action of the fedals, the machine is still driven forwards, but at a slower speed.

The Omnicycle Segmental Gearing is one of the most peculiar and ingenious on the market. It is used in conjuaction with the Omnicycle levers rreviously described, and actuates a long axle, working both wheels simultaneously by means of a ritchet and pawl in their hubs. The segmental gearing itself consits in the first place of a piece of metal of the shape of a circular-topped T , the straight portion of which is slotted throughout its intire length. This slot enables the T piece to slide up and down upon a short frame which is attached by one end to the axle shaft, whilst the other forms a centre upon which two arms work, whose other extremities are jointed to the corners of triangular side pieces or wings. The opposite angles of these wings are jointed to the extremities of the circular $T$ top, whilst to their remaining aņles the ends of a broad steel band are fastened; which band is also fastened in the centre of the top of the T piece. By drawing the frame up and down on the slot by means of a handle the wings ofen

or close as the case may be, causing the steel band to assume different positions corresponding to varying arcs of different sized circles, the smallest being a semi-circle exactly. To the rearmost ends of these steel bands stout leather straps are attached, passing
over the segmental frames and united to pedals at the end of the Omnicycle levers (previously described) by means of wide stirrups or loops, between which the heels sink or rise. Pressure upon the pedals causes these segments of circles to revolve, or rather to be drawn forwards, bringing the axle with them by means of a pair of grippers, and thus imparting motion to the wheels. The segments are attached, as well as to the axle, to a set of chain gear which serves to impart alternate motion to the discs and levers, the downward action of one drawing the other up. The mechanical principle upon which this gear works corresponds with that of the alternate driving motion previously described. The wheels are thus enabled to revolve at will without the pedals, and at varying speeds if requisite, although back pedalling is of course impossible. The expansive nature of the segmental gearing enables the rider to drive direct to size of wheel, or in other words to complete a revolution of the wheel with one stroke from each foot in the ordinary way for down hill or level roads, and to increase his power at a proportionate sacrifice of speed for the ascent of steep gradients, as well as allowing any length of stroke at the rider's will, there being no dead point on the stroke.

As most tricycles are used for road work generally, no machine is complete without some one of the different kinds of

## BRAKES,

so that this article, so very essential to the completion of a machine requires a little attention on my part, as it is not only a useful adjunct to a tricycle, but one which conduces not a little to both the comfort and safety of the rider. There are three great classes of brakes now in use, viz.:-Tyre, ground, and hub brakes, each having several modifications and improvements. The points to be sought for in the selection of a brake are, ist, facility and rapidity of application; 2nd, great power ; 3rd, capability of gradual and continued application; 4 th, safety in use, or non-liability to throw the rider; 5th, simplicity ; 6th, reliability, having no weak points; 7 th, neatness and lightness. The last, however, is quite a secondary object, and, provided the other points are gained, should be left out of calculation entirely. In the use of the brake, too much must not be expected of it, and it must be remembered that the object of a brake is not to pull the rider up sharply in the middle of a hill when going at 12 or 15 miles an hour, but to check the impetus of the machine to such an extent as to keep it well under control. The first I shall describe is a natural one, and should be mastered by all riders, as a fall-back in case of the failure of, or for use in combination with, a mechanical brake. I refer to

Back Pedalling, which consists in applying the pressure on the ascending pedal, instead of the descending one as in the act of propulsion. It requires a little practice to get into; but when learnt, a tricycle can be kept in hand down pretty stiff hills by its use. It has an advantage in being entirely independent of any mechanical
contrivance, but in power is equal only to the strength and skill of the rider, and should his feet get jerked off the pedals he has nothing to fall back upon. Mechanical brakes are as follows. First, the

Tyre Brakes, which, as a class, may be described as a small roller, or long slightly curved piece of iron or spoon, so applied as to press upon the tyre of one or more of the wheels, and so effect the stoppage of the machine. The chief objection to them is, that they wear out the rubbers more or less, the roller, though least effective, being least given to this destructive habit. The varieties of this class exist in the different methods of application adopted by several makers. Acting upon the circumference of the wheel they are in the best possible position for power, and it must also be remembered that the larger the wheel to which they are applied the greater is the effect of one of these brakes upon the speed of the machine. Of this class, the only one adopted upon tricycles of the bicycle pattern is

The Double Lever Brake ; this acts on the wheel with a spoon, which is connected with a bent lever pivotted just above the wheel; at the top it is in two parts, the second, or handle half, being pivotted again to the handle-bar close to the head. In action it is pulled towards the rider with all the fingers of the right hand, whereby the shorter arm of the horizontal lever is moved forwards, imparting a similar movement to the top of the second vertical lever, which of course forces the spoon at its other end downwards on to the wheel. It is very powerful, and can be applied with great nicety if required. As a rule the horizontal lever is very unscientifically fitted, and, in consequence, the strain upon the wrists and fingers is so great that the descent of a long hill will render the hand almost powerless before half way down. This can be remedied by scientific fitting, the fulcrum being close to the head, and the handle extending almost to the end of the steering-bar, and a horn handle at the end will also be found a considerable improvement. The double-lever or pull application is also used upon tricycles of the ordinary pattern by some makers, the handle-lever being pivotted to the lower part of the left purchase handle, and bending round beneath it so as to come within easy reach of the fingers. As a rule, however, there is not sufficient power in this to meet the requirements of most tricycles. Of tyre brakes acting on the larger or medium-sized wheels of tricycles, we have

The Challenge Eccentric Brake. This is applied by means of an eccentric on the left purchase handle, and consists of a small lever with spoon, fitted to the lower end of the backbone in such a way that, when the handle is turned, the lever is acted upon and the spoon brought forcibly in contact with the large driving wheel, which in this case is central and in the rear of the machine. About its power there can be no doubt, and by applying it with the handle instead of by the foot, as of yore, is a great improvement.

The Excelsior Side-wheel Brake is both neat and effective.

It consists of a roller acting on the rubber of the medium sized carrying-wheel, and is applied by the handle, which, when pushed forward, draws a link with it; this latter is attached to a shaft running across the tricycle beneath the seat, and at its other end being provided with an arm, bearing a roller, placed in such a position as to bear upon the tyre of the wheel upon the shaft being turned by the handle.

Double Tyre Brakes have now become pretty general with the increase of equal-wheeled open front machines. They consist of a straight rod running across the machine, and having a spoon and arm at each end just abutting the respective tyres. The rod is supported in bearings on the frame, and turned by means of an arm, either in the middle or at one end, actuated by a simple lever, or by the previously described double lever handle. This class applies the power in the best possible position, but, unless made very heavy, always bend and give a great deal, and sometimes thus get out of truth, producing a greater pressure on one side than the other. To counteract this, and for various other reasons, there are several varieties, as well as several applications, of this brake now on the market, as follows :-

The "Devon" Foot-Tyre Brake consists of a bar running across the front of the machine, having foot-pieces at the sides to accommodate both feet, attached rigidly in a horizontal backward position. By pressing this down with the feet two spoons placed upright at right angles to it are brought to bear upon the rubbers, and so check speed.

Starley's Compensating Arrangement. In this the brake rod is jointed at one end, so as to allow one of the spoons a little play, the result being that full power is not exercised until both spoons are in contact with the wheel.

The Rapid Swivelling Brake attains the same end most perfectly. A socket is hinged to the backbone, and the brake rod, with a spoon at each end, socketted upon it. A lever handle pulls upon a rod attached to the top of the socket, and the hinge allows it to be drawn forward, thus bringing both spoons into action with equal power, making a very safe and reliable brake.

The Pilot Double Tyre Brake is constructed thuswise:-A straight rod runs across the machine immediately behind the seat, and at each end an arm projects bringing a spoon just above the wheel. By pulling up a handle the brake rod is turned, this bringing the spoons down upon the rubbers and effecting the desired results.

The Leicester Compensating Double Tyre Brake brings a small balance gear into action. It is very peculiarly arranged, acting on the tops of both wheels with very broad, deeply hollowed, leaf shaped spoons. The safety-bar previously mentioned contains the carrying rod of the right hand spoon, and the left spoon is a fixture to a short rod at the left side. The ends of both are fitted with bevel wheels, and a small bevel pinion connects the ends of the
two. The pinion works on the base of a rod having a curved rest for the left elbow and forearm at its extremity, by which pressure is applied powerfully and equally upon both wheels.

The Cheylesmore Swing-Lever Double Tyre Brake. In this the brake-rod, instead of passing through bearings rigid with the frame and being twisted to apply the spoons, is fitted in bearings at the ends of a broad jaw-piece hinging on the frame, whilst the spoons are long and fastened to the brake-rod centrally, so that the rod attached to the brake-lever being hinged to the brake-rod


THE "CHEYLESMORE" SWING-LEVER DOUBLE TYRE BRAKE.
draws this forwards and brings the spoons simultaneously and equally on to the tyres, exactly parallel to the centre of the wheel. This brake is without doubt one of the best of its class, being extremely powerful as well as safe, whilst there is but little if any tendency to tear the tyres out of the rims or injure the rubber more than necessary.

Of brakes acting upon the tyre of the small wheel there is now but one variety used, and that but seldom, although the applications at the handle may differ. I shall term this simply the

Rear Wheel Brake, which consists of a long curved spoon bearing upon several inches of rubber; this is pivotted to the outside of the top of the back fork, and is provided with an upright arm, by drawing which forward the spoon is depressed and the brake applied. For this purpose a rod runs from the top of the arm to just behind the bottom of the upright of the left handle, where it is jointed to the bottom of a lever which has its fulcrum upon the handleupright, and bends forward in a horizontal direction. The handle is a pear-shap_d one, placed horizontally, and by drawing up the
forward end of the lever the brake lever is put in action and the brake applied. As the rear wheel is also the rudder, the top of the brake-lever is fitted to the connecting rod by a ball and socket joint, which thus allows the brake to be applied with equal facility, no matter at what angle the rudder-wheel is to the machine. Acting upon the smaller wheel it has not a very great amount of power, but is sufficient for common hills, and has the advantage of acting centrally. About the most effective and most generally-used class, especially with double-driving machines, are

Strap or Band Brakes, which are constructed as follows:-Upon the main axle of the driving-wheel, or on the box containing the balance-gear, a drum or flat-edged disc, some 5 in . or 6 in . in diameter, is fitted, and to the frame immediately in front and below this is pivotted a lever. From a point a little below, a flexible band of steel proceeds, which band, lined with leather, passes round the drum, and is then attached to the lever before mentioned. The action of pulling the lever forwards draws the strap tight round almost the entire periphery of the drum, and so exerts the necessary influence upon the driving wheel. With this class of brake the friction drum should not be less than 5 in . in diameter, and the band should be at least rin. broad, whilst the lever ought to be long, with a leverage of at least I in 10. Care should be taken that no oil gets beneath the leather, or it will not " bite" so well. This brake is capable of very gradual application as well as considerable power, when properly fitted, and hills of formidable steepness may be descended by its aid. Besides the above method, the lever is sometimes placed behind and drawn forward for the application of the brake, whilst sometimes the lever is dispensed with altogether, and the brake applied by pulling, pushing or twisting the left-hand purchase handle.

Lloyd's Double Band Brake. In this a long cross rod passes through the back of the frame, and a couple of long steel bands fastened at one end to pins on the fore part of the frame are brought round drums on the driving wheel axles, and carried to the ends of short pins projecting from the ends of the cross rod. The brakepin on the left side is carried downwards below the rod several inches and a powerful lever thus formed, the extremity of which is hinged to the end of the rod actuated by the left hand through a rack and pinion, as for steering. By drawing the lever end forwards the brake rod is turned, and the bands tightened simultaneously on the drums.

The Caroche Double Brake is a very ingenious construction. The machine is a single driver, and upon the free end of the crank shaft a band wheel is fixed. A steel strap passes round this, and another round the hub of the loose wheel immediately above it, both being simultaneously applied by the application of a lever, one band acting upon the loose wheel itself, the other upon the driving wheel through the crank shaft.

Besides these several varieties of the brake proper, there are
several modifications of the brake-handle in the market, the majority of which have as their main advantage the automatic holding of the brake on at any power, and thus relieving the hand and arm of all strain on long steep hills, which is no small advantage. Of these varieties the first two have a different object.

The National Pull-up Lever consists of a rod, with $\mathbf{T}$ handle, working within the tube of the left purchase handle, and attached at the lower end by a hinge-joint to the end of the brake-lever. It is put in action by pulling up the $T$ piece with the fingers, and is a great advantage in traffic as the brake is always within reach of the fingers, and may be applied instantaneously without removing the hand from the purchase handle. It is not, however, sufficiently powerful for use on long or steep hills, as the human fingers are not capable of exerting any very great or prolonged pressure.

The Centaur Adjustable Brake-handle. In this the handle or lever is made in two parts, the upper or handle half sliding up and down within a socket in the lower portion, being fixed at any height by a set-screw. The advantage of this is that if the purchase handle is raised the brake handle is often in the way of the hand; but by this method it can be raised too, and so taken out of the way, whilst the amount of brake leverage can, too, be altered to suit the requirements of the country or the taste and power of the rider.

The Burdess Sterling Brake-handle is a fac-simile of the steering-handle of that name, previously described, the double tyre brake being applied by means of a screw, which has the effect of enabling a steady and strong pressure to be exerted, and shows but little tendency to run back from the point of power at which it is set.

The Rob Roy Ratchet Brake has two especial features. In the first place the frame is made square-or rather straight-across at the back, and the brake rod runs through the tube. The brake is applied by pushing forward a lever, and to this is hinged a semi-circular ratchet sliding in a brace. This holds the brake firmly in whatever position it may be placed, and is released by the action of a small lever actuated by the finger, which pulls the ratchet rod up out of action. It forms one of the most powerful brakes in use.

The Golightly Brake is very similar in its objects, the brake handle having a spring catch upon it, which fits into one of three notches cut in the outside of a curved bracket. In this case the left purchase-handle forms the brake handle, and the catch is fitted at the side.

In Hillman's Brake the front part of the purchase handle is waved, or has three rises or depressions on its surface. The brake handle encircles this, and on being pulled up drops into one or the other of these depressions, and is there held firm.

The Challenge Brake Holder is a very simple yet effective contrivance. By the side of the brake-lever a sextant shaped flange is fastened to the frame. This flange has ten holes pierced through
it, into which a pin, attached to the end of a short lever working on the side of the brake-lever, drops and holds the brake on at any of the ten points, pressure on the side lever releasing the pin and setting the brake free. Besides keeping the brake on and relieving the hand, this plan secures the brake lever in any position and prevents rattle.

Stassen's Brake Holder. In this a small neat semi-circular ratchet-edged disc is affixed to the frame, and a short lever working on the brake-lever drops a catch into the teeth as it runs over them, holding the brake on at any desired power.

Timberlake's Lever and Brake Holder are identical with those used on carriages. An upright frame is fixed to the frame of the machine on the left hand side, and in this frame a long lever attached to the brake and having the left purchase handle at its forward end, slides up and down, being forced by a spring into any one of a series of ratchet teeth cut on one side of the slide, into which it may come in contact. The lever is very powerful, and the brake instantly applied to any power and held at any point desired without strain on the hands.

The last variety of this important adjunct to the tricycle is the
Ground Brake, of which there is now but one variety. It acts, as may be supposed, by contact with the ground, and although upon the bicycle it has been found almost too powertul, it is scarcely so formidable when applied to the three wheeler. It make a great noise in application, as well as throws up the dust and cuts into the road if the latter is in a dry condition, and it also by metallic contact with the inequalities of the road conveys considerable vibration to the frames of both steed and rider. This is

The Devon Foot Brake, in which a large and heavy spadeshaped ground piece is hinged to the lower part of the front of the frame, and provided with roughened side projecting foot-plates, by which the power is applied. Of course the feet have to be removed from the pedals whilst it is in action.

The brake question having been discussed,

## FOOT-RESTS

claim our attention. These, as a rule, upon tricycles, are very simple, being generally little plates fixed to the sides of the frame just out of reach of the pedals, this class of rest being chiefly in vogue with machines utilising the hay-fork frame. Front steering machines have usually the backbone or main frame curving up over the smaller wheel, and to the top of this a plate is attached bearing two small rods with knobs at their outer ends. These project one on each side, and form both foot-rests and step for mounting.

Adjustable Foot-rests are in a few instances used upon hayfork frames, and usually consist of small pear section plates fitted to the frame with a hinge, and provided with rubber bands or springs, holding them flat against the fork sides when not in use. When
required they are put in action by pressing them down with the feet, and spring up automatically out of the way again upon being released.

Pedal Foot-rests are obtained by fitting the lower chain wheel with clutches or ratchets, as in most open fronted double-drivers, which has the effect of allowing the feet to be kept still when descending hills, the wheels revolving free of the pedals. At first this plan is very awkward, the foothold shifting so, but after a little use one gets into the ways of it.

The Caroche Foot-rests are formed of steel rods curved $\mathbf{S}$ shape, with a hinge at one end, and a projecting side rod at the other. They are hinged to the sides of a hay-fork frame, to which they fit close, being kept from rattling and coming down by a spring. As with the others, they are put to use by pressing down with the feet, when they fall outwards well forward of the frame, and give the rider a somewhat less cramped attitude when using them.

Lloyd's Foot-rests for Ladies. These are fitted to the sides of the frame, and consist of neat rubber-covered crook-shaped rods, which are hinged to the frame, and are kept in a vertical position by light side springs. The pressure of the foot brings them down into a horizontal position for use, and as they are some 6in. in length they give a good foot-hold. On releasing them they resume their vertical position out of the way of everything.

These are all fitted to open-fronted machines. Front-steerers have the foot-rests fitted just behind the head, sometimes consisting of plain and sometimes of roughened rods, as well as at times of rubber-clothed ones. The only variety of this class is the

Hinged Rubber Foot-rest, as first applied to the Sparkbrook National. In this the foot-bars, clothed with rubber, are attached to the end of a short length of spring steel, which is hinged to the neck like the spring of a bicycle. A pad or buffer of rubber is placed on the backbone for the lower end to rest on. It forms a most luxurious rest, and by turning it over it forms an excellent handle with which to lift the front wheel and "manipulate" the machine through gateways and other such places.

The Coventry Foot-rest consists of a short $T$ piece, the top slightly curved, brazed to the frame, which runs out on one side the rider. By placing the left foot on this and crossing the right one over it, a very comfortable rest is obtained.

These points considered, the next things claiming our attention are the very numerous

## ACCESSORIES,

which are more or less necessary to make the tricyclist comfortable, and which have been designed to supply the numerous wants of the wheel-using fraternity.

Under this head come a large number of articles, both large and small, some of which, such as the wrench and oil-can-and, now that
the bye-laws require them, lamps and bells-are necessaries to every tricychst, whilst others are of much use for special purposes, but can be done without by most riders according to circumstances. Taking first the most important, we come to the

WRENCH or SPANNER. In this we find great diversity. The use of the wrench is of course to keep the machine in order, by adjusting the various nuts and bolts with which it is kept together. The desiderata in a wrench are, that it should be fairly light, neat, strong both as regards power and construction, and that it should easily, quickly, and firmly bite all the nuts. There are two classes of wrench, viz., the adjustable and the unadjustable, each of which has numerous variations. Commencing with the latter, we come to

The Flat Wrench, which is made of a flat iron or steel plate, with holes cut either in the middle or on the sides and ends for the different sizes of nuts. They are usually made specially for the machine with which they are supplied, and will fit few nuts on any other ; they are in general handy, neat, and strong, and do not slip from the nut if properly made to fit. If well made, with holes for each size of nut, they are excellent; but very often a tricyclist will have one unfortunate nut on his machine with no corresponding recess on the spanner for it ; or may be, one or two don't quite fit, in which case it is a continual worry and annoyance until a new wrench is procured.

The next class-adjustable wrenches-has rather more varieties, the commonest being the

Screw Wrench. This consists of a stout rod, with a worm cut on its upper end and surmounted by a flat hammer-head, with flat under surface. On this worm, which is flat, or square-sided, another block slides up and down, being pushed into position by means of a separate screw beneath it. By shifting the position of the under-piece the width of the spanner may be adjusted to fit any sized nut. The great objection is that it is wanting in firmness, and when the power is applied the jaws of the wrench are apt to open and slip off the nut, much to the detriment of the user's fingers and temper, besides spoiling the edges of the nut and taking a long time to adjust properly.

There are several patterns of this kind of wrench in use, which differ but little from each other, and there are besides one or two specialities in wrenches which are worthy a separate description. The first of these is

The Challenge Wrench, of which an illustration is given. As will be seen, it consists of an oblong frame at the end of a hollow rod, within which a screw is worked up and down by means of a milled roller, as shown in the sketch; by working the screw up a flat bar sliding in the frame is pressed against the side of the nut, the wrench having been first placed upon it. The whole
article is neat, compact, well made, and strong ; it is 6 in . in length, and has a small jaw cut on the smaller end for the adjustment of the smaller nuts in awkward positions. When once adjusted to the

the challenge wrench.
nut, it is impossible for it to slip off, on account of its having a bearing all round. It takes any sized nut from $1 \frac{1}{4}$ in., but cannot be used on nuts in corners and other curious positions, unless the small jaws on the end will fit them. So far, it is by far the best wrench yet invented.

Bown's Patent Wrench consists of a hollow shaft working for about two turns of the thread upon a short screw immediately below an upright "jaw." Upon this slides at right angles an angular second jaw, which is kept in its place by the shaft. In order to adjust it, the shaft is loosened as required, and the jaw-piece is enabled to work into position on a taper slide, being held in its place by once more re-tightening the shaft.

The Yankee Wrench is a very neat little affair, made entirely by machinery. It is most on the lines of the ordinary screw wrenches, having a slot cut down one side of the body, in which a


THE YANKEE WRENCH.
slide, holding the upper jaw, works. Its chief merit is that, being well and accurately made, and properly hardened, it does not slip, although it is not quite long enough to obtain great power.

The Improved Handy Wrench of the Coventry Machinists' Co. is built much on the same lines, as far as the body of the wrench is concerned, and is adjustable to take the large nuts, the smaller sizes being cut on separate pieces, as well as a screw-driver and several special tools, which all fit into a square socket on one end, and by that means can be easily inserted into awkward places. It is, as its name implies, extremely handy, but care must be taken not to lose any of the separate portions.


IMPROVED HANDY WRENCH.
The Direct Spoke Tightener is ant little instrument, providing at once the handiest and most efficient means by which these bug-bears to beginners may be "laid hold of" and adjusted. It consists of a solid metal block, in shape resembling the half of a hollow square, with the outer edges rounded off, and a corrugated groove at the bottom angle of its inner surface. Through the back of the tool a slot is cut, by which a small wedge-shaped slide is secured, and the top is drilled and tapped; a thumbscrew working in the worm thus made forces the slide down upon the spokewhich is placed in the groove-and grips it fast, when it may be easily turned and adjusted.

The next all-important article to the tricyclist is the Oil-can. This little article has very few variations. That most useful and in general use is the " Goodenough," and imitations of the same. It is made of tin, and is about the size of a large watch, thus fitting easily into the pocket or pouch; it is fitted with a brass nozzle $1 \frac{1}{2}$ in. long, having a cap to screw on the end for the purpose of keeping the oil from coming out, and is also provided with a leather washer between it and the can itself for the same purpose. Both sides spring when pressed, by which means the oil is injected into the bearings. These are the best in use ; some of superior quality are made entirely of brass, whilst the chief alteration in other kinds is that of having short thick spouts, and with some only one side is made to spring; and quite recently, owing to a suggestion in The Cyclist, there has been introduced

Butler's Pin Oil-can, which is an ordinary pocket oiler of the "Goodenough" pattern, but has a pin soldered by the head to the inside of the screw cap. This pin passes down the spout of the can, and keeps it always clear of dirt and free from being clogged up in any way, which is a great boon, whilst by sticking the pin in the coat, the cap is kept in safety whilst using the oiler-a better and more agreeable plan than holding it in the mouth.

Price's Patent Telescopic Oil-can has a tube down its centre, into which the spout slides when pressed down. It is forced out by a spring, and when down out of sight the aperture is closed by a surew cap, which is attached to the body of the can by a chain. This makes the oil-can more compact, does away with the nozzle, and takes the spout out of the way.

Bown's Pneumatic Oil-can is provided with valves in the interior, preventing the escape of the oil until pressed; this admits of the entire abolition of the usual screw-cap on the end of the nozzle, which is apt to get lost, to fall down in the dirt when using, or even occasionally to work loose and allow the oleaginous contents of the can to emerge from its recesses and spread themselves over the interior of the valise or pocket.

The Salisbury Reservoir is an invaluable companion on a long tour-on the Continent especially-as it holds as much as half a dozen ordinary oilers, and fits nicely in the saddle valise. It is in shape very similar to an ordinary phial, being about +in . long and rin. in diameter, and fitted with a brass screw-cap and leather washer.

LUBRICATORS being closely connected with the oil-can, come next. They are simply small reservoirs, and their use is to keep a supply of oil in juxtaposition to the bearings, so that on a long journey they may not require frequent oiling. Most machines have holes drilled through to the bearings for the application of oil, and some makers insert a screw or plug therein to keep out the dust. It is into these holes the lubricators are screwed. They are of several kinds, the neatest being

Cup Lubricators, which are quite artistically designed, being small brass cups with screw-caps, the whole in shape after the pattern of a low vase.

Pillar Lubricators are not nearly so neat or handsome, being simply short cylinders of brass with screw-caps. These both have a hole drilled through them downwards at the bottom, whereby the oil finds its way to the bearings.

Spring-top Lubricators have their covers hinged to them, and pressed down tightly by small and neatly fitted springs ; they are Ar, as with the ordinary ones it is rather a nusance unscrewing and again putting on the tops, which operations, besides making the fingers generally dirty, occupy some little time, and the tops are liable to get lost. Somewhat similar are

Bown's Spring-cap Lubricators, in which a hollow cap fits over the top of a pillar lubricator, being attached to the same by a coiled wire spring in the interior. In oiling up the cap is lifted, the oil put in, and the cap allowed to resume its original position.

Even better still than these are
Valve Lubricators, which consist of ordinary lubricators with solid tops, which latter have small holes in their centres, large
enough to admit the nozzle of the oil-can. Inside, short coiled springs force plugs upwards into the holes above, and so keep out the dust. To fill them, all that has to be done is to press down the plugs with the top of the oiler, and inject the oil into them.


The Rapid Lubricator, as will be seen by a reference to the illustration, is bulbous in shape. The top is screwed on, and has an aperture $\mathbf{A}$ at one side to admit the nozzle of the oil-can, which aperture is kept closed, and only opened when requisite by a slight turn of the top. Whilst speaking of the oil-can, I must not forget to mention.


CHALLIS'S FOCKET OIL-CAN CASE.
Challis's Registered Oil-can Case, which is simply a useful pouch of leather, with flap and button, in which to carry the oil-can, if by necessity or inclination it is carried in the pocket.

Another necessity is
The Valise or Pouch, in which the wrench, oil-can and sundry odds and ends are carried. Of course these articles can be stowed away in the pockets; but a pouch is so convenient and cheap that few do without it, as pockets stuffed full are extremely in the way, besides being untidy; it is also not over pleasant for the top of the oil-can to come off-as it does sometimes-and pour out its oleaginous contents into one's pocket. Valises are of several kinds; the best are made of good leather, with 2 in . side and bottom pieces, so as to enable them to hold a decent amount; they are fastened by a couple of straps and buckles to two staples fixed behind the saddle, or to the side or back of the seat-if that be used-so that they can be easily got at or taken off if required. A very useful size is one fitting the rear of the seat, and some $12 i n . \times 15$ in. in size, wiih flap cover,
and pockets both inside and out. A stamp sent to Messrs. Lamplugh and Brown, ${ }^{135}$, Great Colmore Street, Birmingham, will secure a catalogue with illustrations of several useful patterns for attachment to the back of the saddle ; the most useful of which is, perhaps,

The Don Tool Bag, which, as may be seen by reference to the annexed illustrations, consists of a triple set of pockets for holding


THE DON TOOL BAG.
the various articles, the whole being folded over in neat form, and secured by a top flap and strap around the body of the bag.

For touring, special provision has been made, and Lamplugh and Brown have brought out one or two bags which will take a lot of beating. These are

The Tricyclists Multum-in-Parvo ${ }^{\prime}$ Bag, made of strong leather and waterproof canvas, with capacious interior, and pockets


THE TRICYCLIST'S MULTUMI-IN-PARVO.
both inside and out. It has a handle for carrying portmanteau fashion when not on the machine, to which it is attached by strong and suitable straps.

The Tricyclist's Serviceable Touring Bag is a larger edition of the same bag, made square in shape and deeper, with outside pockets on the front, and flap as shown in the cut. It is made, like the last, for attachment to the back of the seat or saddle.


The Tricyclist's Gladstone Bag is made on the principle of the well-known travelling bag of that name. It has a flat solid back, the front closing in to it as may be requisite, whilst it is also provided with a set of outer pockets for the tools and smaller articles.


THE TRICYCLIST'S GLADSTONE BAG.
Both these bags are held together by strong real leather connec.
tions, every part being hand-sewn and consequently firm. They have great capacity, having inside and outside flaps, and quite a multiplicity of small pockets, with strap lids outside, for the stowage of the oil-can, spanner, and such smaller articles as may be needed by the tricyclist at odd times during his journey. Another form of bag for shorter journeys and general purposes is
The Tricyclist's Circular Luggage Valise, r6in. long by gin. in diameter, with solid leather ends and waterproof canvas top. It opens by a flap throughout its wh le length, and is very useful for carrying multifarious articles in.


THE IDEAL TRICICLE BAG.

The "Ideal" Tricycle Bag of Hillman, Herbert, and Cooper is, like the last, circular in shape. As will be seen by the accompanying sketch it is divided into two compartments, with a central flap like a portmanteau, whilst it also has an outer pocket for tools, $\& c$. , and is got up in the best style, with spring lock, plated mounts, \&c., \&c.

Bale's Patent Folding Luggage Basket is made of light wicker work, and has lock and key or strap fastening. Its peculiarity consists in its construction, whereby it can be folded up nearly flat


Closed.
BALE'S FOLDING LUGGAGE BASKET.
when empty or holding only a little, the sides shutting inwards upon themselves. The construction will be readily seen by the annexed illustrations. It is capable of carrying a far larger quantity of luggage without fear of injury than any other, and is easier to pack and unpack when on the machine.

With seats, especially those with backs to them, the attachment of these various travelling cases is an easy matter, but with a saddle more difficulty is found, and to obviate this to some extent Messrs. Lamplugh and Brown have recently introduced

The Luggage Carrying Frame, shown in the annexed cut, which, as will be seen, consists of a light iron frame attached to the valise hooks which are to be found under the back of every saddle; the frame is so arranged as to form a foot, on which the luggage rests, whilst two pair of stout straps are provided for making all secure. It is especially designed for use with the Gladstone bag.


The next article used in connection with the machine is one which is now rendered obligatory by the bye-laws under which wheelmen are now regulated. This is

The Bell, the use of which is, of course, to give the public due warning of the approach of the cyclist, and so give them time to
" make themselves scarce." Of these instruments we find a numerous variety in use, of variable merit. They may be divided into two great classes, viz., Continuous and Silenceable. Many riders do not like them, contending that they frighten the horses, that they are taken no notice of by pedestrians, that they are in the way, and are intolerable nuisances, all of which objections are certainly pretty close to the mark. The first and last objections are remedied more or less in the second class, whilst the second may be somewhat overcome by the use of a really loud sounding article in place of the tinkling alarums commonly in use.

The Spherical Bell is a small sphere, having a number of slits across its lower half, and enclosing an iron ball which rattles on being shaken. It is the same pattern as those used on sleighs, dog collars, \&c. The loudest are those with a single division, every cross-cut decreasing the strength of the sound, but rendering it less harsh. On a long journey, its continued tinkling is extremely disagreeable and trying to the nerves. Some affix it to the centre of the wheel ; but the best place is on the curve of the steering handle or in the hand, as it can then be quickly silenced or put in the pocket. Small leather straps are also sold for attaching them to the machine.

So much for the first class of alarums. We now pass on to the second or silenceable variety, the first on our list being

Challis Bros. White Metal Stop Bell, which is of the same shape as the ordinary bells, but one of the holes in the upper half of the sphere is fitted with a spring and socket, into which the weight tightly and accurately fits. The weight itself is provided with a cord, by which it is pulled into quietude, and kept there as shown in the cut. A pressure of the finger then forces the ball again into the

interior of the sphere, where it sounds forth its melodious notes. ad libitum. Messrs. Challis have also introduced a bracket for the attachment of the bell to the machine in such a position that the best possible sound is got out of it when in action.

The Facile Stop Bell is barrel shaped, and has a hole at the top through which a short chain passes, attached to an india-rubber ring. This chain is fastened to the clapper of the bell, which is large for the size of the bell, and the whole is fixed to the frame in such a position as to bring the clapper almost in contact with the bell, in order that the slightest movement may sound it. When.


FACILE STOP BELLS.
silence is required, the rubber ring is pulled, thus bringing the clapper tight up into a socket at the top, and by slipping the ring over a pin it is kept firmly in place. It is well and strongly made, gives a very pleasing loud and clear ring, does not seem likely to get out of order, and is absolutely silent when required ; whilst by the recent addition of

The Facile Finger Alarum, which is a light spring strip (a) bent down over the side of the bell and provided with a knob or striker at its lower end. All the functions of an alarum for emergencies are retained, making it a most perfect instrument. It is made with a special attachment suiting it to the handles of tricycles.

Gongs are used similar to those for shop doors, tables, electric bells, \&c. These are fastened on the handies, and fitted with a loose spring hammer, by pressing which, and again releasing it, the bell is rung-of course at the will of the rider only. They are neat, and give a good sound. Very handy and cheap forms of this pattern are

The Butterfly Alarum and Harrison's $1 / 6$ Gong, which very


BUTTERELY ALARUM.
much resemble each other, are simple in construction, cheap, and easily and quickly fitted to the machine. They are, however, best with bicycle pattern machines.


STORMONT'S PATENT CHIME BICYCLE ALARUM.
Stormont's Alarum is a neat and effective contrivance of two gongs, placed opposite one another, on the same vertical staff. It is worked by pressing a button at the top, which in its descent works two catches and spring hammers, concealed in the interior in such a manner that one press on the button produces no less than six different soundings. Whilst perfectly silent when not required, it can in a moment at will be caused to make a terrific din, even when almost standing stili ; in such case, for instance, as waiting behind a cart in a narrow street for it to make room to pass. Its only objection is that it is continually coming to pieces, but a little careful attention now and then, and adjustment with the spanner, will put all to rights.

Harrison's Alarum is one of the best in use, and is somewhat akin to the last. It consists of a single or double gong, provided with a semi-circular rack, inside which works a hammer. It screws on the handle, and by pressing a small finger-plate the rack is caused to move its whole length, thus producing about a dozen sharp and rapid beats of the hammer upon the gong. It is also made to strike upon its return to position, where it is forced by means of a spring ; thus the rider can produce some twenty or more distinct peals by a single pressure of the finger. The objection to this is that the "whirr" made by the working of the ratchet dulls and confuses the sound of the gong.-Harrison's latest is a large double gong some 4 in . in diameter. It strikes loudly and clearly, and I have not found it show any tendency to come to pieces or get out of order. It is made specially for use on tricycles.


HARRISON'S ALARUMS.
Snell's Big Ben Alarum is a single note gong of great power and depth of tone. On the cross-bar, within the bell, a mouse-trap or coiled spring is placed, and two brass wires placed in connection with it, one carrying a heavy ball, whilst the other is cranked out and bent so as to form a handle, the pressure and release of which produces one loud clear note.

The Inchcape Bell is about the most powerful alarum on the market. It is large, and of a somewhat different shape to the generality of bells, the gong being of the shape of a Turkish fez.


THE INCHCAPE BELL.
It is very loud in tone, and quite startling. It can be attached to any machine.

Whistles, Bugles, and Horns are sometimes used by bicyclists, but rarely by tricyclists, so a description of their varieties would be but waste of space, suffice it to say that this subject is thoroughly treated upon in my " Indispensable Bicyclists' Handbook."

LAMPS are extremely useful to those who ride at night, besides which they are, as well as bells, now made compulsory in most districts ; they are of numerous shapes and sizes, qualities and prices. In order to insure a good light, they should be so constructed as not to be blown out by the wind, and also to be proof against sudden jerks caused by the unevenness of the road; they should also give a clear flame, without smoke, and ought to throw the light well forward and over as large a space as possible, besides being neat in appearance and compact in size.

The class of lamp, as a rule, used on tricycles, are those known as "head lamps" when used by bicyclists, and tricyclists generally either carry one of these on the head of their tricycles or a pair, which are fixed either one at each side upon brackets fitted for the purpose, upon each handle support or in each of the side wheels, these latter being more out of the way, but not so convenient for lighting, re-filling, \&c. Besides a few of the cheaper forms of lamp forced to do duty upon the three wheeled steed by many makers, a few are specially constructed and deserving of meritorious mention.

In the Salsbury Noiseless Lamp the chief point is in the fixing of the handle, which consists of a leather strap passing through flattened metallic tubes, by which means the liability of being shaken out by vibration is done away with, and all rattle avoided. It is fitted with plate-glass front, coloured side lights and wind-up burner.

Platts' Candle Lamp, in reality a small and neat form of the ordinary carriage lamp, with dome top, plated pedestal and side glasses, is a very tasty and neat variety. It is also very clean, there being no oil to spill about and collect the dirt. For appearance it certainly is well in it.


PLATAS' CANDLE LAMP.
The Eddystone Lamp is a very handsome, taking, oil lamp, built after the style of a carriage lamp; it has a powerful reflector and broad wick, and is by no means heavy. Its leading constructional features are that the lower half of the "handle" is hollow and forms a spare reservoir for onl, whilst the reservoir properwhich is provided with a wind-up burner on the outside-can in a second be taken out from below, and the lamp trimmed or lighted without fiddling about the door.


THE EDDYSTONE LAMP.
These three can only be used upon brackets or handles. Hub lamps for tricycles require specially large holders, as the hubs of tricycle whet ls are so much larger than those of bicycles. Of these

The "King of the Road" is really a formidable-looking lamp, being very long though narrow, and tapering to the shape of the
wheel from top to bottom. The oil chamber is large and holds a good quantity, and two wicks are used, set at an angle to each other. It gives a magnificent light, burns steadily, and also possesses an important feature in all the parts being rivetted together with copper rivets, no solder being used in its construction, thus making it


Shut.


Open.
the " king of the road."
perfectly safe when placed inside a wheel (although failure in this respect is not a matter of such certain danger as is the case with a hicycle). Although usually used as a hub lamp, I have seen the "King" most effectively fitted upon two bars projecting forwards below and in front of the handles. A special pattern with thick rubber springs at the back is usually fitted on handles or brackets, and makes an excellent lamp. As most tricycle hubs have a lubricator in the centre, the axle cylinder of this lamp is made in two portions, to allow this to revolve freely, and a further improvement has this year been made in fitting them with steel bearings which are screwed on the axle or hub, the lamp being by them held very firm and steady, and at the same time this is done without the help of the guide rods, which are thus done away with, making a neater lamp and avoiding the wear on the plating of the side flanges. The "King of the Road" this year has also been provided with a side window, through which the match for lighting may be inserted without opening the door and exposing the flame to the wind.

Eades' Fountain Lamp is a very ingenious invention. It is of the head variety, the chief peculiarity consisting in the whole of the back of the lamp forming the reservoir and, on the same principle as the pneumatic chicken-feeders, keeping the wick holder always full until the oil is exhausted. It will hold in this way sufficient oil for 16 or 18 hours' use.

Cooper's Inextinguishable Hub Lamp is suspended from the bottom, and, as will be seen from the illustration, is secured to the


COOPER'S INEXTINGUISHABLE HUB LAMP.
axle with a cylindrical fastening, this being kept from opening by two wire bolts, which turn down, and cross and interlock each other. From this depend four straight rods, two on each side, running in slides on the sides of the lamp, and kept from slipping out by catches at their ends. These serve as guides, keeping the lamp in a vertical position. It is suspended and actually fastened to the cylinder by two spiral springs held in tubes on each side the lamp, to the bottom of which they are fastened. This method allows the lamp to be free from the vibration caused by an uneven road, the lamp remaining stationary whilst the wheel jumps up and down. I have used one of these, and find it-true to its name" inextinguishable," being unaffected alike by road or wind.

The Eclipse Lamp of Messrs. Rea, Neale and Bourne, is constructed much upon the same pinciple, though with some improvements. The lamp in the first place may be described as being thoroughly well made throughout, all parts being copper rivetted and clamped, with a deep and large oil reservoir. The body of the lamp is suspended from the axle cylinder by two strong spiral springs working in polished brass cylinders in the fore part of the


THE ECLIPSE HUB LAMP.
sides of the lamp, these cylinders being lined with rubber, and otherwise so constructed as to make the lamp perfectly silent in action.

The Caroche Lamp has a difference, in that, in place of being provided with guides at the top sides to keep the lamp in place, as with all others, the centre of the axle cylinder is constructed with a groove or double flange, which fits upon a collar, turned upon the centre of the axle case of the wheel for the purpose.

Besides these there are several other hub lamps used upon bicycles, but I believe these are the only ones having hubs built to the special requirements of the tricycle.

Salsbury's Champion Tricycle Lamp is the largest by far I have ever seen applied to a tricycle. It is quite a monster in size, having bull's-eye oval front and bull's-eye side lights, with powerful reflector, and double wick with large reservoir. The barrel fastening is attached to the lamp by means of two wires bent somewhat S fashion, and is placed at right angles to its usual position, being in a line with the direction of the light instead of across it, as is usually the case. The reason of this is that it is intended to fasten, not to the wheel axle, but to the backbone of a hay-fork frame, thus taking a position centrally, and casting its rays between the rider's legs. It is a magnificent lamp, though I fancy the rider's legs would somewhat interfere with the effect, and a lady's dress entirely annul it. This lamp is fitted with

Salsbury's Patent Wick Holder, consisting of a long staple of pin wire, with pointed ends. This passes through the wick, and also through holes in the wick channel, and its purpose is to prevent the vibration causing the wick to slip down and disappear in the oil chamber.

Snell's Detachable Lamp Bracket consists of a short upright on which to fit the holder of a head lamp, attached to a jawed base, having flanged sides and a cross piece beneath fastening to the first by a couple of pins and nuts. This is bolted on to the frame in any position desirable, and is especially adapted for use on the Coventry Rotary.

Dearlove's Detachable Sociable Lamp Bracket curls upwards and forwards gracefully, and ends in a short bar projecting on one side of the centre of the curl. It is admirably adapted for hanging an ordinary King of the Road hub lamp on to.

I will now describe the varieties of another class of instrument, which may be reckoned as luxuries rather than necessaries. I refer to

DISTANCE REGISTERS, of which there are several in the market. They are, of course, in connection with the driving wheel, and are very useful for those who desire to know the exact distances travelled by them. Some give the distance in number of revolutions, in which case they are suitable for any sized wheel, requiring only a little calculation to find the exact distance run. Others again record the distance in miles and furlongs, when of course the length of the journey can be seen at once; these require to be specially made to size of wheel.

Thompson's Cyclometer, of which an illustration is given, shows either revolutions or miles and yards, as preferred, and is so constructed that a train of wheels, contained in a case, is set in motion by a weight, which remains stationary whilst the case and mechanism revolve, being attached to the axle of the driving-wheel inside by means of a flexible steel band and thumb screw. It is a neat and strong instrument, impervious to dust or wet, well out of the way, and tells the distance accurately.


THOMPSON'S CYCLOMETER.
Johnson's Road Measure is another neat little instrument. It consists, as before, of a train of wheels, with dial plates showing either distance or revolutions; these are set in motion by a ball which runs in a groove round the instrument; this ball remains stationary whilst the body of the instrument is carried round by the wheel. At one point in the groove, four cross arms are so arranged that one of them is always across the channel, so that the ball coming in contact with it moves it forward, drawing the next one after it to undergo the same operation; by this means motion is imparted to the leading wheel, and the whole set in action. It is secured to the interior of the driving-wheel by means of two straps, one of which, passing round the instrument itself also encircles the axle, whilst the other is strapped round two of the spokes. It is extremely neat, out of the way, well protected, and a good indicator.

Stanton's? Bicycle Log outwardly much resembles Thompson's, with the exception of having but one hand in place of four. It is fixed to the axle in the interior of the driving-wheel, and the clips for that purpose are so constructed as to fit any diameter of axle.

The single face shows the distance in miles, the motive power being obtained by means of a falling plate and arms, so constructed that it is impossible for it to repeat, or fail to act by any jerk of the machine.


STANTON'S BICYCLE LOG.
Underwood's Odometer is both cheaply and simply constructed. It is circular, and screws on to the axle, between the hub flanges. It marks the miles up to ten on one dial, and in hundreds up to to three hundred on a smaller dial. A falling plate actuates a toothed wheel, which gears with another, showing at once the miles, and on the axle of this an eccentric works, which marks the hundreds on the dial plate. It is sold at a very cheap figure. Besides these there are various other etceteras which have been introduced to add to the comfort of the rider or the efficiency of the machine, of which I may mention

Starley's Wheel Washer, consisting of an oblong box, provided with rollers running from side to side a few inches from each end, and also with two pair of circular brushes fixed, face outwards, upon the inner side of the box. To use it the wheel is placed in the box, resting upon the rollers, and the box filled with water. On turning the wheel the brushes rub against the sides of the rim, and so clean it in double quick time. It must be remembered that the rims


STARLEY'S WHEEL WASHER.
get dirty quickest, and take as long as any portion to thoroughly clean, so that the saving in time is something considerable. Another useful etcetera is

Phillips' Tyre Binder, consisting of a coil of steel wire, which, when placed around a loose tyre and the rim, holds the two together and keeps the tyre from coming off.

Rudge's Tyre Clips answer the same purpose, but are neater and more easily put on, and are carried in less space. They consist of strips of spring steel, $\frac{1}{2}$ in. broad, bent into about four-fifths of a circle, with the two ends bent inwards sharply. They are put on from beneath, and bearing against the rim hold the tyre with the bent ends. These little things are but id. each, and are very useful, in fact no tricyclist should be without them on a lengthy trip.

Butler's Waterproof Saddle-Cover is, as its name denotes, a waterproof saddle-cover. It is made of very thin water-proofed silk, and can be rolled up and put in the waistcoat pocket when not in use. Its object is to cover the saddle when leaving the machine in the rain, and so keep a dry seat, as a wet one is most uncomfortable and even dangerous.

Butler's Spoke Brush is another useful accessory in the shape of a tapering brush which will fit into the spaces between the closest spokes, and clean the wheel both quicker and better than tinkering about with a cloth.

The Tricycle Cabinet is a very useful case of parts and fittings, in a partly finished state, sufficient material being provided for any ordinary amateur mechanic, with his head screwed on right, to put together a sound, strong machine of the rear-steering single-driving class. All the material is sound, and all the heavy work is donesuch as bending the frame, welding the forks to the head, \&c. Several modifications can be had in pattern, if desired, and ball bearings and other luxuries at a slight extra cost.

The Tricyclists' Missing Link has just been discovered. It consists of two parts, one attached to the pedal, the other to the boot or shoe. The first is a light loop of steel attached below the centre bar of the pedal by a couple of screws, and running back a few inches curves slightly upwards. The second part is a plate with a central hook which is attached to the sole of the boot, fitting the instep, and coming close up against the heel. This hook on the foot being drawn slightly back takes hold on the steel loop and enables a backward and upward pull on the pedal to be obtained, in addition to the usual forward and downward thrust.

The Beatrice Shield is a contrivance to protect the dress of lady riders from contact with the oily chains, and to shield the action of her feet from the vulgar gaze. It is made of papier maché, and fits on to the frame of any tricycle by a set of screw clamps, and is, as will be seen by the sketch, provided with a pair of small doors, opening in front like those of a hansom cab. It thoroughly effects its purpose, and weighs about io lbs.


THE IBEATRICE SHIELD.
Harrington's Enamel is a species of japan, being in much the same manner baked into the metal. Unlike japan, however, the enamel does not chip or crack, and should any portion be removed the surroundings do not peel as with japan, paint, and plating. It is done in any dark colours or combination of colours, and has a most effective appearance, whilst it is not only perfectly impervious to wet and rust, but is also acid proof even. I have had it in use now many months, and have never before been "happy" about my machine after a rainy run, but now I can leave it for a month without attention, and it will be none the worse. I confidently anticipate that it will almost entirely supersede both paint and japan in the finish of bicycles.

The Cyclists' Trouser Fasteners are small hooks of steel wire, with double points bent round pointing towards each other. There is a central coil to give a firm hold to the fingers. Their use is to hold the trousers close round the ankle when riding in them, and they are put on by folding the trouser leg over in a neat fold and fastening the hook across, when the two points pull against each other, and they cannot come undone. They are of steel, hardened, tempered, and japanned to prevent rust.

The American Handy Hooks are for the same purpose, and are "built" in three pieces, viz., two hooks of the same shape as the ends of the last, and a length of coiled spring, to each end of which a hook is swivelled. The stretch obtained by the spring effectually prevents their coming out. They are got up in good style, and sent out nickel-plated and carded in pairs.

Halliwell's Cyclist's Shoe is made of very pliant leather, and can be bent about in any direction. In pattern it resembles the running shoe, being low and laced to the toe, where is found the peculiarity adapting it so well for bicyclists' use, for the toe is not only ventilated, but very slightly "puffed," so as to allow the toes
plenty of room and to spare. They are most comfortable in use, and admirably fulfil the purpose for which they are intended. This brings us to the conclusion of the examination of parts, pieces, and etceteras, but improvements and alterations are being made almost daily, some of which will be found in the addenda at the end of the present volume, whilst those to come will receive full attention in my next.

Ticehurst's Folding Houses are made of seasoned pine, panelled and roofed. They are painted on the outside in two colours, and the insides are coloured white. As will be seen by the illustration, they are made to fold up, so that if not wanted they take up but little room, and may be easily carried about. For those who have yard room without any covered space in which to house a tricycle they are a great boon, as are also


Braby's Portable Houses, which are made of sheets of corrugated iron, with lock up door, being built either as a lean-to or complete on all sides. They are light, and easily and quickly put together.

brabi's portable houses.

## $\rightarrow$ D. RUDGE \& CO., 提 COVENTRY.



THE"RUDGE"BICYCLE.


THE "COVENTRY CONVERTIBLE"OETATOHEO


THE"COVENTRV CONVERTIBLE:


The Fifty Miles Amateur Tricycling Championship on the Road, was won on a "Coventry Rotary," in the marvellous time of 3 hr 3.47 mins . 40 secs., thus beating record by over 34 minutes.

PRICE LISTS AND ALL INFORMATION FREE ON APPLICATION TO THE

## WORKS: COVENTRY.

London Depot ... ... ... 12, Queen Victoria Street, E.C.
Manchester Depot... ... ... ... 160 to 164, Deansgate.
Birmingham Depot ... ... ... ... ... 4, Livery Street.
Liverpool Depot ... 2a, Old Post Office Place, Church Street.

## SECTION III.

## A Glance at the Tricycle Trade of the United Kingdom, With Full Description of upwards of 250 Machines.



YEAR or two since, anyone talking of the "Tricycle trade of the United Kingdom" would have been adjudged a lunatic, but the case is very different now, for during the past three years a trade has sprung up of no mean importance, not only in Coventry, the centre of the wheel-making industry, but in many other towns besides. Many thousand hands are employed in the various branches connected with the industry, in which close upon one hundred firms are engaged, of which about twenty are manufacturers of tricycles only, and a like number depend upon tricycle building as the chief, or, at any rate, as a very important branch of their wheel businesses, whilst the rest manufacture tricycles as an assistance to their bicycle and other work. The trade is by no means a confined one, although, as may be expected, it is mostly followed at the great centres of bicycle manufacture, and in consequence

Coventry naturally comes to be the chief seat of the trade. Here, indeed, it originated, as the first practical tricycles were sent out from hence, and these proving to the public their utility and practicability, as a natural sequence, brought grist to the mills of their introducers. Now in a town so largely devoted to one trade, one firm cannot long be doing a successful line with any branch of it without some inkling of it getting to the ears of other manufacturers, and so it was in this case, for the different makers of bicycles seeing the success attending the first introduction of a three-wheeler, immediately set themselves to work devising new patterns for themselves, and although many of the first attempts were somewhat crude and impractical, constant attention to the subject has at last produced a large number of very useful vehicles, and this town may be, fairiy and without prejudice, said to lead the world, and be the chief seat of this especial branch of manufacture. In all, there are twenty tricycle manufacturers in Coventry, who turn out about eighty varieties ; of these, seven are tricycle makers alone, whilst all the others are in a more or less large way as bicycle manufacturers, and give no small amount of attention to this branch of their trade.

In point of number of manufacturers
Birmingham comes next, with a dozen-manufacturing an average of two patterns each-the majority of whom have but recently entered the lists in competition. The lead set by the two largest rifle and arms manufacturing firms in the town has been taken up more extensively, and the use of machinery and the interchangeable system brought largely into operation. All the Birmingham makers have considerable additional trade in bicycles, rifles, and other things.

London and Neighbourhood ranks next, containing a dozen makers proper, and six proprietorial agents, or firms vending machines of especial pattern, which, although not actually made by themselves, are their exclusive property, and are sold as such. All these firms, with the exception of one, are comparatively new to this part of the wheel trade. Five are manufacturers of tricycles only, whilst the rest unite bicycle making and other industries with it.

Wolverhampton, well known for cheap bicycles, naturally goes in largely for cheap tricycles, and pretty generally makes a point of copying other makers' patterns at a cheaper rate. Five or six makers have their habitat here, of whom two are in a large way as bicycle makers as well, and one may be termed a proprietorial agent. All, with a single exception, are-comparatively speaking-new to this especial branch of the trade.

Leicester finds two makers just getting well into the tricycle trade, one being already well known in connection with the manufacture of bicycles, whilst the bicycle makers of

Nottingham, Maidenhead, Hull, Portsmouth, Bedford, Manchester, and Northampton likewise are waking up to the importance of the new industry, whilst in the United States there are now two makers of tricycles firmly established, not including makers of toy machines and baby carriages ; and we may expect many additions in various places before the season is out, if we may judge by the number of patents for "improvements in tricycles and other velocipedes" which are weekly ${ }^{\circ}$ taken out. In considering individually the different machines in the market, as I have in this sketch of the trade noted the various seats of manufacture, I shall, to avoid dispute, take all machines in alphabetical order. I shall describe their construction, with the help of the previous section, as concisely as possible, and in the case of very novel patterns will look at a few points in theory in connection therewith, and shall also give the results of my own practical experience upon those machines I have been able to try. For this latter purpose I may mention I have been to some very considerable trouble during the past seasons to try as many as I possibly could-especially the new patterns-the makers having very kindly assisted me in every way possible by placing machines at my disposal for the purpose. Where I could I have taken the machines under consideration out into the country for some 10 or 15 miles over the same road, and carefully noted results by comparison, as well as any peculiarities in action possessed by particular machines. Some one or two of the machines which I tried at their first introduction have been much improved and altered since my trials, and I have made allowance accordingly ; on the whole, as regards speed, I do not find so much difference between the makes as I had at first imagined, and rather lay stress upon their other capabilities and sperial features. In conclusion, I hope before the end of the coming season, and the preparation of
the fourth edition of the present work, to be able to give the majority of the different types of machine now in the market a far more extended trial, upon which I shall of course duly report in that volume.


Manchester Tricycle Co., 14, Exchange Arcade, Deansgate, Manchester.
Leading Features. Front steering. Double driving with balance gear.
Description. Two 48 in . and one 20 in . wheel. Driving wheels 48 in ., running level. $\frac{7}{8}$ in. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. G.M. hubs. Ball bearings to all wheels. Stanley rudder head. Rack and pinion steering. Spade handles. Double-cranked pedal shaft. Rubber pedals on plain bearings. Chain driving, and Hillman's double driving gear. Push lever band brake. Adjustable seat rod. Elliptical spring. Saddle. Footrests on frame. Adjustable wrench. Ollcan. Bell. Width 36in. Weight 9jlbs. Loop frame.
Price .. .. .. .. £19 19s. 0d.

Sent out with plated spokes and handle fittings, rest painted in two colours.
Remarks. A sound, strong, front steering double driver, with no very special features.

## ADVANCE-D.D.

James Beech, Gladstone Works, Wolverbampton.
Leading Features. Front steering; double driving by balance gear.
Description. Two 50 in . and one 20 in . wheel. Driving wheels, 50 in ., running level. ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 and 24 , No. 11 direct spokes. G.M. hubs, $5 \frac{1}{2} \mathrm{i} u . ~ x ~ 4 i n . ~ B a l l ~ b e a r i n g s ~ t o ~ a l l ~ p a r t s . ~ S t a n l e y ~ r u d d e r ~ h e a d . ~$ Rack and pinion steering. Spade handles. Double-cranked pedal shaft. Rubber pedals. Chain driving and balance gear very similar to Pritchard's. Push lever band brake. Adjustable seat rod. Scroll spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Bell. Lamp. Dressguard. Width 38 in . Weight 97 lbs . Loop frame.
Specialties. Balance gear.


THE ADVANCE.
Price .. .. .. £15̃ 0s. 0.̉. Sent out painted in two colours.
Remarks. A neat machine at a very low figure for a front steering double driver.

## ÆOLUS.

## A. H. Ward, Cross Street, Smethwick.

Leading Features. Open front. Rear steering. Single driving.
Description. Two 44 in . and one 20 in . wheel. Driving wheel 4 in., running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. red rubbers. Crescent rims. 44 and 20 direct spokes. Iron huos. Plain bearings to driver, and cones to steering wheel. Stanley rudder head. Rack and pinion steering. Spade handle. Pear-shaped purchase handle. Double-cranked pedal shaft, running in plain bearings. Rubber pedals on plain bearings. Chain driving. Double tyre brake. Adjustable seat rod. Elliptical spring. Cushioned seat. Footrests on frame. Screw wrench. Oilcan. Weight 85 lbs . Width 33in., reducing to 28 in . by taking off loose wheel. The frame is the ordinary hayfork pattern.

$$
\begin{gathered}
\text { Price .. .. .. ... £12 0s. 0d. } \\
\text { Sent out with bright spokes and seat rod. } \\
\text { Extras. Ball bearings, } £ 4 .
\end{gathered}
$$

Remarlis. An ordinary machine.

## ALASKA No. 1-D.D.

English Cycle Co., Cradley Heath, Birmingham.
Leading Features. Open front. Rear steering. Double driving with two chains. Novel brake application.

Description. Two 44 in . and one 22 in . wheel. Driving wheels 44 in ., running level. lin. and $\frac{7}{8}$ in. rubbers. Crescent rims. 50 and 20 , No. 11 direct spokes. G.M. hubs. Ball bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shaft, 6 in . throw. Rubber pedals, plain. Double chain driving, and ratchet double driving gear. Rack and pinion double tyre brake. Adjustable T seat rod. Elliptical spring. Special seat. Pedals form footrests. Flat
wrench. Oilcan. Valise. Lamps. Bell. Width 36in., reducible to 30in. by taking.off a wheel. Weight 891bs. Hayfork frame.

Specialties. Rack and pinion application of the brake. Construction of driving ratchets. Seat.
Price .. .. .. .. £20 0s. 0d.

Sent out half plated, rest painted in two colours.
Extras. Plated ail over, 70s. Except rims, 50s. Ball pedals, 10s.
Remarks. This machine is a rear steering double driver, of somewhat better design than usual. The brake is applied by a rack and pinion like the steering, so that only two handles are used, and the seat is a sort of cross between seat and saddle, built on lines recommended by Dr. Richardson.

## ALASKA No. 2.

English Cycle Co., Cradley Heath, Birmingham.
Leading Features. Open front. Rear steering. Single driving.
Description. Two 42 in . and one 21 in . wheel Driving wheel 42 in ., running level. ${ }_{5}^{7} \mathrm{in}$. rubbers. Crescent rims. 50 and 24, No. 11 direct spokes. G.M. hubs, 6 iu. x 5 in. Ball bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade handles. Double cranked peadl shaft, 6in. throw. Rubbeer pedals, plain. Chain driving. Rack and pinion double tyre brake. Adjustable $\Gamma$ seat rod. Elliptical spring. Special seat. Footrests on frame. Flat wrench. Oilcan. Bell. Lamps. Valise. Width 36 in ., reducible to 30 in . by taking off the loose wheel Weight 851 l s. Hayfork frame.

Specialties. Rack and pinion brake application. Special seat.
Price .. .. .. .. £18 0s. 0d.

Sent out half-plated, rest painted in two colours.
Extras. All plated, 70s. Ball pedals, 10s.
Remarks. A soundly constructed machine of the usual type.

## ALASKA No. 3.

English Crcle Co., Cradley Heath, Birmingham.
Leading Feature: Open front. Rear steering. Single driving.
Description. Two 40 in . and one 21in. wheel. Driving wheel 40 in ., running level. $\frac{7}{8} i n$. rubbers. Crescent rims. 50 and 24, No. 11 direct spokes. G.M. hubs, $6 \mathrm{in} . x 5 \mathrm{in}$. Ball bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade handles. Double cranked pedal shaft. $5 \frac{1}{2}$ in. throw. Rubber pedals, plain. Chain driving. Rack and pınion double tyre brake. Adjustable $\Gamma$ seat rod. Elliptical spring. Pan seat Footrests on frame. Flat wrench. Oilcan. Lamps. Bell. Valise. Width 36in., reducible to 30 in . by taking off the loose wheel. Werght 801 lbs . Hayfork frame.

Specialties. Rack and pinion brake application.
Price .. .. .. .. £14 0s. 0d.

Sent out with bright spokes and handle fittings, rest painted in two colours.
Extras. Plated parts, 30s. Plated all over, 80s. Ball pedals, 10s.
Remarlis. A rather smaller machine than the last, and more suitable for ladies' use.

> ALBION--D.D.

Warman, Laxon, \& Youett, Albion Mills, Coventry.
Leading Features. Open front. Rear steering. Double driving, with clutch gear and patent chains.

Description. Two 40 in . and one 18in. wheel. Driving wheels, 40 in ., running level. $\frac{7}{8}$ in. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 50 and 20 , No. 10 direct spokes. G.M. hubs, $6 \mathrm{in} . \times 4 \frac{1}{2} \mathrm{in}$. Ball bearings. Stauley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, $5 \frac{1}{2}$ in. throw. Detachable rubber pedals. Warman's. patent chains for driving, and clutch double driving gear. Push lever double tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Yedals form footrests. Adjustable wrench. Oilcan. Width 36 in ., reducible to 29 in . by taking off a wheel. Weight 90lbs. Hayfork frame.

Specialties. Warman's patent driving chains (page 69).

$$
\text { Price .. .. .. } £ 16 \text { 16s. 0d. }
$$

Sent out with bright spokes and handle fittings, rest painted in two colours. Extras. Adjustable handles.
Remarks. A very good open-fronted two-chain double driver.

## ALLEGRO-D.D.

Bicycle and Tricycle Supply Co., 21, Princes Alley, Wolverhampton. Leading Features. Front steering. Double driving.
Description. Two 50in. and one 20in. wheel. Driving wheels 50in., running: level. ${ }_{8}^{7}$ in. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. Direct spokes. G.M. hubs. Ball bearings to steering wheel, drivers and crank shaft. Stanley rudder head. Rack and pinion steering. spade handles. Double-cranked pedal shaft. Rubber pedals, plain. Chain driving, and double driving gear. Push lever band brake. Adjustable seat rod. Elliptical spring. Web-seated saddle. Footrests on frame. Pedals form footrests. Adjustable wrench. Oilcan. Valise. Bell. Lamp. Weight 991bs. Loop frame.

$$
\text { Price .. .. .. .. £ } 16 \text { 10s. } 0 \mathrm{~d} .
$$

Sent out with bright spokes and handle fittings, rest painted in two colours.
Remarks. Not having seen this machine I cannot well speak as to its merits.

## APOLLO-D.D.

Singer \& Co., Challenge Works, Alma Street, Coventry.
Leading Features. Front steering. Double driving, by balance gear.
Description. Two 48 in . and one 16 in . wheel. Driving wheels 48 in ., running as 42 in . ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 and 20 , No. 1 ? direct buttended spokes. G.M. hubs. Apollo ball bearings to all whee, s and crauk shaft. Stanley (Andrews' long centres) rudder head. Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shaft, 6in. throw. Singer's patent rubber pedals, plain. Chain driving, and Pritchard's patent double driving gear. Push lever band (6in. x lin.) brake. Adjustable seat rod. Elliptical spring. Suspension saddle. Rubber clothed footrests on frame. Flat wrenches. Oilcan. Width 38in. Weight 98lbs. Loop frame of weldless steel tube, with single side tilt rod.

Specialties. Pritchard's balance gear (page 83). Singer's rubber pedals (page 26). Apollo ball bearings (page 35). Challenge brake holder-extra (page 99). Harrington's enamel (page 123).
Price .. .. .. .. £25 0s. 0d.

Sent out with plated hubs, spokes, and handle fittings, rest painted in two colours, or enamelled plain black in Harrington's enamel.
Extras. All plated, £10; balls to pedals, 30s.; 1in. tyres, 20s.; brake holder, 7s. 6d. ; Г pin, 2s. 6d.

Remarks. Formerly known as the Challenge No. 6, this machine has been thoroughly overhauled and re-designed, as well as re-christened. It is now


THE APOLLO.
one of the finest and most vertically built front steerers in the market, and will compare favourably with many, tspecially in the matter of strength.

## APOLLO SOCIABLE-D.D.

Singer \& Co., Challenge Works, Coventry.


THE APOLLO SOCIABLE,

Leading Features. Front steering for two riders. Double driving with balance gear.

Description. Two 46 in . and one 18 in . wheel. Driving wheels 46 in ., running as 42 in . lin. and $\frac{7}{8} \mathrm{in}$. rubbers. Crescent rims. 60 and 20, No. 12 direct buttended spokes. G.M. hubs. Apollo ball bearings to all wheels and crank shaft. Stanley long centre rudder head. Rack and pinion steering. Adjustable spade handles. Donble-cranked pedal shaft, 6in. throw. Singer's patent rubber pedals, plain. Chain driving, and Pritchard's patent double driving gear. Push lever band ( $8 \mathrm{in} . \times 1 \frac{1}{4} \mathrm{in}$.) brake. Adjustable seat rods. Arab Cradle springs. Pan seat and suspension saddle. Rubber clothed footrests on frame. Flat wrench. Oilcan. Width 58in. Weight 145lbs. The frame is a double loop of weldless steel, with central tube running straight out to the rudder wheel from the axle tube, and supported by a vertical tube on the fore part of the frame.

Specialties. Apollo ball bearings (page 35). Pitchard's balance gear (page 82). Singer's rubber pedals (page 26). Challenge brake holder-extra (page 99). Harrington's enamel (page 123).
Price .. .. .. .. £31 0s. 0d.

Sent out with plated hubs, spokes, and handle fittings, rest painted in two colours or enamelled plain black in Harrington's enamel.

Extras. All plated, £14; balls to pedals, 60s.; brake holder, 7s. 6d.; Г pin, 2 s .6 d .

Remarks. A first-class sociable in every way. Is well built, well finished, and sound in every detail. The action is fully vertical and the steering wheel well in front. It is a very handsome machine. (See Advertisement.)
ARAB—D.D.
J. Harrington and Co., Enamel and Cradle Srring Works, Much Park Street, Coventry.
Leading Features. Front steering. Double driving with ratchet gear.
Description. Two 48 in and one 20in. wheel. Driving wheels 48 in ., running level. $\frac{7}{8}$ in and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 48 and 20 , No. 11 spokes, nutted at rim. G.M. hubs. Ball bearings to steering wheel and driving shaft. Stanley rudder head. Rack and pinion steering. Spade handles. Doublecranked pedal shaft. Rubber pedals. Chain driving, and ratchet gear. Push lever double band brake. Adjustable seat rod. Arab cradle spring. Long distance saddle. Pedals furm footrests. Adjustable wrench. Oilcan. Width 39in. Weight 981 lbs . Loop frame.

Specialties. Arab Cradle spring (page 50). Harrington's enamel (page 123). Driving plan. Spokes nutted at rim.
Price .. .. .. .. £20 0s. 0d.

Sent out with plated spokes and handle fittings, rest enamelled in two colours in Harrington's enamel.
Remarks. A strong easy running machine, driven by two chains, which drive the through axles, the ends of which drive the wheels with ratchets. (See Advertisement.)

## ARAB BLACK BESS-D.D.

Harrington \& Co., Much Park Street, Coventry.
Leading Features. Open front. Rear steering. Double driving with two chains.
Description. Two 50in. and one 20 in . wheel. Driving wheels 50 in ., running as 46 in . ${ }^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. red rubbers. Crescent rims. 50 and 60 , No. 12 spokes, nutted at rims. Steel hubs, bin. x 4in. Parallel bearings to driver, and cones to steering wheel. Stanley rudder head. Rack and pinion steering. Spade handles. Double-cranked pedal shaft running in plain bearings. Singer's
patent rubber pedals, on plain bearings. Double chain driving. Eccentric double tyre brake. Adjustable seat rod. Harrington's Cradle spring. Pan seat. Screw wrench. Oilcan. Valve lubricators. Weight 95lbs. Width 36in. Hayfork frame.


THE ARAB BLACK BESS.
Specialties. Cradle spring (page 50). Harrington's enamel (page 123). Spokes nutted at rims.

$$
\text { Price .. .. .. .. } £ 18 \text { 0s. 0d. }
$$

Sent out enamelled all over with Harrington's enamel.
Extras. Plated all over, £6. Balls to all parts, £4.
Remarks. This is very strongly and soundly made. The pedals can be used as footrests when descending hills. It runs very easily. (See Advertisement.)
ARGUS-D.D.

Blenheim \& Son, New Egham, Surrey.
Leading Features. Front steering. Double driving, with clutch gear.

Description. Two 48 in . and one 20 in . wheel. Driving wheels 48 in ., running level. $\frac{7}{8}$ in. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 49 and 20, No. 11 direct spokes. G.M. hubs. Ball bearings to steering wheel, rollers to drivers. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 6 in. throw. Rubber pedals, plain. Chain driving, and ball clutch double driving gear. Push lever double band (5in. x 1in.) brake. Adjustable seat rod. Arab Cradle spring. Suspension saddle. Pedals form footrests. Adjustable wrench. Oilcan. Width 40 in . Weight $951 b s . L o o p$ frame.

Specialties. A neat form of ball clutch, somewhat akin to the Cheylesmore. Price .. .. .. .. £18 0s. 0d.

Sent out japanned black and gold.
Remarks. A front steerer, driving both wheels by separate chains. Is decently made and a fair article.

## ARION No. 1.-D.D.

Hrll \& Morton, Trafalgar Works, Upper Well Street, Coventry.
Leading Features. Front steering. Double driving with two chains.
Description. Two 50 in . and one 18 in . wheel. Driving wheels 50 in ., running level. $\frac{7}{8}$ in. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 and 24, No. 11 direct spokes. G.M. hubs. Plain bearings to all wheels. Stanley rudder head. Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shaft. Rubber pedals, plain. Double chain driving, and ratchet double driving gear. Push lever double band brake. Adjustable 「 seat rod. Elliptical spring. Pan seat. Pedals form footrests. Adjustable wrench. Oilcan. Width 39in. Weight 95lbs. Loop frame.

Sent out painted in two colours.
Extras. Balls to all wheels, £2 15s. Non-slipping tyres, 10s. Suspension seat, 12 s . 6 d . Cradle spring, 10 s .

Remarks. A new introduction. Vertically built, and has a powerful brake. Seems a very fair ${ }_{s i}$ article. (See Advertisement.)

ARION No. 2.
Hel \& Morton, Trafalgar Woris, Upper Well Street, Coventry.
Leading Features. Open front. Rear steering. Single driving.
Description. Two 40 in . and one 18 in . wheel. Driving wheel $40 \mathrm{in} .$, running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 and 24 , No. 11 direct spokes. G.M. hubs. Coned bearings to steering wheel, plain to driver. Stanley rudder head. Rack and pinion steering. Adjustable spade handles. Doublecranked pedal shaft. Rubber pedals, plain. Chain driving. Pull-up lever double tyre brake. Adjustable $\Gamma$ seat rod. Elliptical spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Width 39in., reducible to $33 i n$. by taking off the loose wheel. Weight 851 lbs . Hayfork frame.

$$
\text { PRICE .. .. .. .. } 12 \text { 10s. 0d. }
$$

Sent out with bright handle fittings, rest painted in two colours.
Extras. Ball bearings, 55s. Suspension seat, 12s. 6d. Cradle spring, 10s.
Remarks. An open fronted rear-steerer of the ordinary type. (See Advertisement).

## ARROW-D.D.

Arrow Tricycle Co., Watson Street, Stoke Newington Green, London, N.
Leading Features. Front steering. Double driving, with balance gear Variable speed for hill work. Lever action.

Description. Two 50 in . and one 18 in . wheel. Driving wheels 50in., running at any speed down to 20 in . $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 50 and 20, No.

11 direct spokes. G.M. hubs. Ball bearings to all wheels. Stanley rudder head. Ruck and pinion steering. Adjustable spade handles. Grout's Arrow adjustable levers. Rubber disc and band driving, and Grout's balance gear. Push lever double band brake. Adjustable 「 seat rod. Elliptical spring. Long-distance suddle. Pedals form footrests. Adjustable wrench. Oilcan. Width 39in. Weight $991 b s$. The frame is of the T pattern, with a bar at the back to act as a fulcrum for the levers.

Specialties. Grout's Arrow adjustable levers (page 66). Grout's balance gear. Price |.. .. .. .. £23 0s. 0d.
Sent out with plated handle fittings, rest painted in two colours.
Extras. Folding arrangement to reduce width to 24 in ., 40 s .
Remarks. This machine is quite different from last year's Arrow in every respect. The Arrow variable power levers drive by means of straps off discs à la Omnicycle, which discs actuate a balance gear and through this the wheels. The machine has many good points, and is far and away ahead of the old Arrow.

ATALANTA.
St. George's Foundry Co., Pope Street, Birmingham.


Leading Features. Open front. Rear steering. Left-hand steering. Two speeds.

Description. Two 40 in . and one 18 in . wheel. Driving wheel $40 \mathrm{in} .$, running as 54 in . and 32in. 1in. and ${ }^{7} \mathrm{in}$. rubbers. Crescent rims. 44 and 18, No. 10 direct spokes. G.M. hubs, 5 in $\times 3_{1}^{1} \mathrm{in}$. Ball bearings to steering wheel, plain to driver, and ball to crank shaft. Socket rudder head. Rack and pinion steering. Adjustable spade handles. Left-hand steering. Double-cranked pedal shaft, 6in. throw. Rubber pedals, coned. Vertical wheel two speed gear. Push lever Rapid double tyre brake. Adjustable $\Gamma$ seat rod. Rapid easy spring. Suspension saddle. Pedals form footrests. Flat wrench. Oilcan. Width $36 \frac{1}{2}$ in., reducible to $29 \frac{1}{2} \mathrm{in}$. by taking off the loose wheel. Weight 88lbs. Hayfork frame.

Specialties Left hand steering. Rapid swivelling brake (page 96). Vertical wheel gear (page 89). Easy spring (page 51). Rapid ball bearings (page 33).

Price .. .. .. .. £18 18s. 0d.
Sent out with plated fittings, rest painted in two colours.
Remarks. A single driver, which has two speeds for hill work and the level. The feet may remain stationary when descending hills, and the machine may be driven backwards equally as well as forwards. Thoroughly well made.

## AURORA-D.D.

St. George's Foundry Co., Pope Street, Birmingham.
Leading Features. Front steering. Double driving with balance gear. Two speeds.
Description. Two 48 in . and one 20 in . wheel. Driving wheels 48 in ., running as 48 in . and 34 in . ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 52 and 24 , No. 10
direct spokes. G.M. hubs. $5 \frac{1}{2}$ in. $x 4$ in. Rapid ball bearings to all wheels, an 1 crank shaft. Socket rudder head. Rack and pinion steering. Adjustable spade handles. Double cranked pedal shaft, 6 in. throw. Rubber pedals, coned. Chaiu drıving, and Rapid double driving gear. Push lever band (9in. x lin.) brake, with holder. Adjustable $\Gamma$ seat rod. Rapid easy spring. Suspension saddle. Footrests on frame, and pedals also form footrests. Flat wrench. Oilcan. Valve lubricators. Width 35in., reducible to 29in. by taking off righthand wheel. Weight 108 lbs . Loop frame of weldless steel.

Specialties. Rapid two speed gear (page 83). Rapid ball bearings (page 33). Diana balance gear (page 82). Easy spring (page 51).

$$
\text { PRICE .. .. .. .. } 21 \text { 0s. 0d. }
$$

Sent out with plated spokes and handle fittings, rest painted in two colours.
Remarks. This is a well built, strong machine, with several good points. It is vertically built, and the two speeds are simple and effective in action.

## BEDFORD.

(See Manumotive Machines.)

## BERKSHIRE-D.D.

William Soper, 22, Friar Street, Reading.


THE BERKSHIRE.
Leading Features. Front steering. Bicycle handles. Double driving when ruuning straight. Two speeds.

Description. Two 48in. and one 24 in . wheel. Driving wheels 48 in ., running level or as 26 in . $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Potential rims. 40 No. 9 , and 20 No. 10 direct spokes. G.M. hubs, 7in. x 4in. Coned bearings to all wheels, crank shaft, and pedals. Open centre spring rudder head. Bicycle handles. Bicycle cranks. Rubber pedals. Central chain driving, and sliding key for double driving. Screw lever band ( $5 \frac{1}{2} \mathrm{in}$. x $1 \frac{1}{4} \mathrm{in}$.) brake. Two spiral springs. Suspension saddle. Footrests on frame. Two flat wrenches. Oilcan. Width 39 in . Weight 126 lbs . The frame forms a sort of diamond, with diagonal bars, the whole constructed of light flat steel bars screwed together by nuts and bolts.

Specialties. Frame. Double driving arrangement. Spring head. Soper's two speed gear (page 90).
Pbice .. .. .. .. £17 17s. 0d.

Sent out with bright handle fittings, rest painted in two colours.

Remarks. This machine is totally different to any other, both wheels are riqidly driven, both backwards and forwards, and in turning corners one is freed by moving a handle in connection with a sliding clutch. It has two speeds and vertical action, and is strongiy and soundly put together.

BIRKBECK No. 1.
C. Snow, Birkbeck Road, Kingsland, Londou, N.

Leading Features. Open front. Rear steering. Single driving.
Description. Two 42 in . and one 17in. wheel. Driving wheel $42 \mathrm{in} .$, running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 44 No. 11 , and 20 No. 12, direct spokes. G.M. hubs, 5in. x 4in. Ball bearings to steering wheel, plain to driver and crank shaft. Stanley rudder head, and hollow forks. Rack and pinion steering. Adjustable sprde steering handle, and pear shaped purchase handle. Double-cranked pedal shaft, $5 \frac{1}{2}$ in. throw. Four-bar rubber pedals, plain. Intermediate wheel driving gear. Pull-up lever double tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Flat wrench. Oilcan. Valise. Width 36in., reducible to 22 in . by taking off both wheels. Weight 791bs. Hayfork frame.

$$
\begin{gathered}
\text { Price } \quad . \quad . \quad . \quad . \quad . \quad £ 16 \quad 16 \mathrm{~s} .0 \mathrm{~d} . \\
\text { Sent out painted in two colours. } \\
\text { Extras. Ball bearings all over, } £ 3 \text { s. }
\end{gathered}
$$

Remarks. A soundly built machine, fairly light and handy. Well positioned. The gearing is on the right hand side, in place of the left as usual.

## BIRKBECK No. 2.

## C. Snow, Birkbeck Road, Kingsland, London, N.

Leading Features. Open front. Rear steering. Single driving.
Description. Two 42 in . and one 17in. wheel. Driving wheel 42 in ., running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 44 No. 11 , and 20 No. 12 direct spokes. G.M. hubs, 5 in. x 4 in. Ball bearings to steering wheel, plain to driver and crank shaft. Stanley rudder head, and semi-hollow forks. Rack and pinion steering. Adjustable spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, $5 \frac{1}{2}$ in. throw. Rubber pedals, plain. Chain driving. Pull-up lever back wheel tyre brake. Adjustable seat rud. Elliptical spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Valise. Width 36 in ., reducible to 22 in . by taking off the wheels. Weight 801 ls . Hayfork frame.

$$
\text { Price .. .. .. .. £ } 15 \text { 0s. 0d. }
$$

Sent out painted in two colours.
Remarks. The same as the last, but with chain gear and back wheel brake.

## BI-TRI-CYCLE.

## A. Gwinnett \& Co., 6, Alma Street, Wolverhampton.

Description. Driving wheel according to height of rider, others 20 in . Red rubbers. Crescent rims. Nipple spokes. Solid hubs. Fixed slotted bicycle cran s. Rubber pedals. Roller bearings to driving wheel, plain to smaller ones. Hollow forks. Stanley head. 24in. horn handles. $1 \frac{1}{2} \mathrm{in}$. backbone. Saw step. Bolted sliding spring. Pigskin saddle. Double lever brake. Leg-guard. Bell. Wrench. Oilcan. The frame is very similar to that of a bicycle, but at the point where the back fork usually is attached a bar is hined centrally across, having depending ends resting upon a long straight rod, carrying the two small wheels at its ends. Springs are fitted at each side to enable the wheels to accommodate themselves to the road.

$$
\text { Price, } 48 \mathrm{in} \text {. to } 50 \mathrm{in} . \quad . \quad £ 10 \quad 0 \text { s. } 0 \text {. }
$$

Remarks. It was a machine of this pattern, somewhat improved in constructiou, and having the rear wheels close together, that the Tricycle Championship
of 1880 was won upon. It was built specially for the race by John Keen, and although of course fast, could not stand upright by itself. It was christened the "Rara Avis," and, true to its name, has not appeared since.

## BRITANNIA.

Laxton \& Simmons, Britannia Works, Jordan Well, Coventry.

the britannia.
Leading Features. Open front. Rear steering. Single driving.
Description. Two 44in. and one 18 in . wheel. Driving wheel 44 in ., running level. 5 in . and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 50 and 20, No. 11 direct spokes. G.M. hubs, $6 \frac{1}{2}$ in. x $4 \frac{1}{2} \mathrm{in}$. Ball bearings to steering wheel, plain to driver and crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, $6 \frac{1}{2}$ in. throw. Three-bar rubber pedals. Chain driving. Pull-up lever double-tyre brake. Adjustable 「 seat rod. Special Salvo pattern spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Valise. Width 39in., reducible to 33 in . by taking off the loose wheel. Weight 85 lbs . Hayfork frame.

$$
\text { Price .. .. . .. . .. } £ 17 \text { 0s. 0d. }
$$

> Sent out painted in two colours.

Remarks. A soundly-built machine of the ordinary type. Strong and handy.
CAMBRIAN No. 1.
Morris Bros., 16, Angel Street, Cardiff.

the calibrian no. 1.

Leading Features. Open front. Rear steering. Single driving.
Description. Two 44in. and one 16 in . wheel. Driving wheel 40in., running as 50 in . $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 40 and 20 , No. 12 direct spokes. G.M. hubs. Coned bearings to steering wheel, plain to driver. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 6in. throw. Rubber pedals. Plain chain driving, Pull-up lever band brake. Adjustable $\Gamma$ seat rod. Cambrian spring. Suspension saddle. Footrests on frame. Flat wrench. Oilcan. Valise. Width 39in., reducible to 30in. by taking off the loose wheel. Weight 85lbs. Hayfork frame.

Specialties. Cambrian spring (addenda).

$$
\text { Price .. .. .. .. } £ 16 \text { 0s. 0d. }
$$

Sent out with bright hubs and steering rod, rest painted in two colours.
Extras. Balls to all wheels, 60 s.
Remarks. A sound machine of the usual type.
CAMBRIAN No. 3-D.D.
Morris Bros., 16, Angel Street, Cardiff.

the CAMbrian no. 3.
Leading Features. Open front. Rear steering. Double driving, with clutch gear. Vertical action.

Description. Two 40 in . and one 16 in . wheel. Driving wheels 40 in ., running as 50 in . ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 40 and 20 . No. 12 direct spokes. G.M. hubs. Plain bearings to all wheels. Stanley rudder head. Rack and pinion steering. Adjustable spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 6in. throw. Rubl er pedals, plain. Double chain driving, and ratchet double driving gear. Push lever double tyre brake. Adjustable $\Gamma$ seat rod. Cambrian spring. Suspension saddle. Pedals form footrests. Adjustable wrench. Oilcan. Valise. Width 39in. Weight 881 lbs . Hayfork frame, bent back so as to bring the driving cranks behind the axles and the action vertical.

Specialties. Cambrian spring (addenda).

$$
\text { Price .. .. .. .. } £ 18 \text { 0s. 0d. }
$$

Sent out with briglit hubs and steering rod, rest painted in three colours.
Remarks. A vertically built rear steering double driver, of fair quality and neat appearance.

CAMBRIAN No. 5-D.D.

## Morris Bros., 16, Angel Street, Cardiff.

## L $\rho$ ading Features. Front steering. Double driving with balance gear.

Description. Two 50 in . and one 16 in . wheel. Driving wheels 50 in ., running as 46 in . $\frac{7}{6} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 and 20, No. 12 direct spokes. G.M. hubs. Ball bearings to steering wheel and driving shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade steering handle, and pear-shaped purchase handle. Double cranked pedal shaft, 6in. throw. Rubber pedals. Chain driving, and Starley's patent double driving gear. Push lever baud brake. Adjustable $T$ seat rod. Cambrian spring. Long distance saddle. Footrests on frame. Adjustable wrench. Oilcan. Valise. Width 39in. Weight 9811 s . Loof frame.

Specialties. Cambrian spring (add, nda).
Price .. .. .. .. £21 0s. 0d.

Sent out with plated handle fittings, rest painted in three colours.
Remarks. A well built and neatly de-igned front steering double driver; will make a good mount for anyone.

CAMBRIAN No. 6-D.D.
Morris Bros., 16, Angel Street, Cardiff.
Leading Features. Front steering. Double driving, with two chains and clutch gear.

De:cription. Two 50 in . and one 16 in . wheel. Driving wheels 50 in ., running as 46 in . ${ }^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 and 20 , No. 12 direct spokes. G.M. hubs. Ball bearings to all wheels, and plain to crank shaft Stanley rudder head. Rack and pinion steering. Adjustable spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 6in. throw. Rubber pedals, plain. Double chain driving, and ratchet double driving gear. Push lever double band brake. Adjustable $\Gamma$ seat rod. Cambrian spring. Pan seat. Pedals form footrests. Adjustable wrench. Oilcan. Valise. Width 39in. Weight 1001 bs . Loop frame.
Specialties. Cambrian spring (addenda).
Price .. .. .. .. £21 0s. 0d.

Sent out with plated fittings, rest painted in three colours.
Remarks. A sound, vertically built, front steerer, driven with two chains, like the Devon. It runs steadily and well.

CAMBRIAN SOCIABIE-D.D.
Morris Bros., 16, Angel Street, Cardiff.
Leading Features. Front steering. Independent double driving.
Description. Two 46 in . and one 20 in wheel. Driving wheels 46 in ., running level. ${ }_{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubkers. Crescent rims. 50 and 30, No. 12 direct spokes. G.M. hubs. Coned bearings to steering wheel, plain to drivers and crank shaft. Stanley rudder head. Rack and pinion steerıng. Adjustable spade steering handle, and pear-shaped purchase handles. Double-cranked pedal shaft, 6 in. throw. Rubber pedals, plain. Double chain driving, and ratchet gear. Push lever double band brake. Adjustable $\Gamma$ seat rods. Cambrian springs. Pan seats. Footrests on frame. Adjustable wrench. Oilcan. Valise. Width 72in. Weight 147lbs. The frame is of $T$ pattern, with the ends of the cross piece at the back bent down an 1 forwards to carry the crank shaft ends.

Specialties. Cambrian springs (addenda).

$$
\text { Price .. .. .. .. } £ 25 \text { 0s. 0d. }
$$

Sent out with plated fittings, rest painted in two colours.
Remarks. A steady running front steering sociable, with open front to each rider, independent driving and clutch action to the pedals, which may thus be used as footrests or intermittent strokes taken.

## CAROCHE CONVERTIBLE-D.D.

The Caroche Tricycle Co., Much Park Street and Jordan Well, Coventry.
Leading Features. Front steering. May be used as a single or double. Double driving, with balance gear in both forms.

Description. Two 48 in . and one 20 in . wheel. Driving wheels 48 in ., running as 46 in . 1in. and $\frac{7}{8} \mathrm{in}$. rubbers. Crescent rims. 50 and 20 , No. 10 direct spokes. G.M. hubs. Coned bearings to steering wheel, plain to drivers and crank shafts. Stanley rudder head. Rack and pinion steering. Adjustable spade steering handle, and pear-shaped purchase handles. Double cranked pedal shafts. Rubber pedals. Central chain driving, and Starley's patent double driving gear. Push lever band brake. Adjustable seat rods. Special Salvo pattern springs. Pan seat and tricycle saddle. Footrests on frame. Adjustable wrench. Oilcun. Width 72in., reducible to 39 in . by taking the machine in two. Weight 1401bs. The frame is of steel tube of the double loop pattern, with two tubes in the centre, making each half complete in itself.

Specialties. Method of converting.

$$
\begin{gathered}
\text { Price .. } \quad . \quad . \quad . \quad . \quad . . \\
\\
\\
\text { Sent out painted in two colours. }
\end{gathered}
$$

Extras. 50 in . wheels, 20s. Cradle springs, 10s. each. Balls to front wheels, 15 s . Half plating, 60 s .

Remarks. The converting arrangement of this machine is simple and ingenious. The balance gear and chain are in the middle, and by taking out a pin which connects the two axles and one which connects the fore part of the frame, the machine is taken in half. The off wheel is detached and put on the other half, a crown wheel on its inner hub gearing at once with the pinion of the balance gear, the outer crown wheel of which is removed with the other half the machine. The machine is well and neatly made, and very handy.

CAROCHE DOUBLE DRIVER-D.D.
Caroche Tricycle Co., Much Park Street and Jordan Well, Coventry.


TEE CAROCHE DOUBLE DRIVER.

Leading Features. Front steering. Double driving by balance gear. Intermediate wheel gear.

Description. Two 46 in . and one 18 in . wheel. Driving wheels 46 in ., running level. $\frac{7}{8}$ in. and $\frac{3}{4}$ in. rubbers. Crescent rims. 46 and 18, No. 10 direct spokes. G.M. hubs, 6 in. $\times 2 \frac{3}{4} \mathrm{in}$. Plain bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinon steering. Adjustable spade steering handle, and pear shaped purchase handle. Double cranked pedal shaft, 6in. throw. Rubber pedals, plain. Caroche patent ball wheel gearing, and Starley's patent double driving gear. Push lever band ( $5 \frac{3}{8} \mathrm{in} . \times \frac{7}{8} \mathrm{in}$.) brake. Adjustable $\Gamma$ seat rod. Special Salvo pattern spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Width 40 in . Weight 941 lbs . Loop frame of lin. steel tube.

Specialties. Caroche ball wheel gearing (page 70).

- Price .. .. .. .. £18 0s. 0d.

Sent out painted in two colours.
Extras. Plated fittings and spokes, 50 s .
Remarks. A remarkably easy-running machine, built with fair verticality and of sound material.

CAROCHE No. 1.
Caroche Tricycle Co., Much Park Street and Jordan Well, Coventry.

the caroche no. 1.
Leading Features. Open front. Rear steering. Single driving. Intermediate wheel gear.
Description. Two 40in. and one 18in. wheel. Driving wheel 40 in ., running as 46 in . ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 40 and 18 , No. 10 direct spokes. G.M. hubs, $5 \frac{1}{4} \mathrm{in}$. $x{ }^{\frac{1}{4} \mathrm{in}}$. Plain bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Spade handles. Double-cranked pedal shaft. Rubber pedals, plain. Caroche patent ball wheel driving gear. Pull-up lever Caroche double band brake. Adjustable seat rod. Special Salvo pattern spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Width 39 in ., reducible to 30 in . by taking off the loose wheel. Weight 88 lbs . Hayfork frame, of $1 \frac{3}{8} \mathrm{in}$. steel tube.

Specialties. Caroche ball wheel gearing (page 70). Caroshe double band brake (page 98).
Price .. .. .. .. £14 14s. 0d.

Sent out with bright hubs and handle fittings, rest painted in two colours.
Extras. Half bright, 203. Plated fittings, 403.
Remarles. An easy running, open fronted, single driver. It is neatly made, and the brake is exceedingly good for this class of machine.

CAROCHE No. 2.
Caroche Tricycle Co., Much Park Street and Jordan Well, Coventry.


THE CAROCHE NO. 2.
Leading Features. Open front. Rear steering. Single driving.
Description. Two 4 in. and one 18 in . wheel. Driving wheel $44 \mathrm{in} .$, running level. ${ }_{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 44 and 18 , No. 10 direct spokes. G.M. hubs., $5 \frac{3}{3} \mathrm{in} . \mathrm{x} 3 \frac{1}{4} \mathrm{in}$. Plain bearings to all wheels and crank shaft. Stanlev rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft. Rubber pedals, plain. Chain driving. Grasp lever double tyre brake. Adjustable seat rod. Special Salvo type spring. Pan seat. Foetrests on frame. Adjustable wrench. Oilcan. Width 39in., reducible to 30 in . by taking off the loose wheel. Weight 84lbs. Hayfork frame.

$$
\text { Price .. .. .. .. } £ 12 \text { 10s. 0d. }
$$

Sent out with bright hubs and handle fittings, rest painted in two colours. Extras. Plated fittings, 40 s .
Remarks. A sound machine of ordinary typz, at a verv reasonable figure. A machine for ladies is built on the samэ lines, but with 40 in . wheels, at $£ 1$ less.

## CELER-ET-AUDAX.

## W. Lewis, Tempest Works, Wolverhampton.

Leading Features. Direct.driving. Both large wheels used for steering purposes.
1 Description. Two 54in. (or other size to order) and one 18 in . wheel. Driving wheel 54 in ., running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. red rubbers. Crescent rims. 60 and 20 direct spokes. G.M. hubs, 6 in. x 4 in. Roller bearings to driver, and cones to steering wheels. Socket rudder head. Celer-et-Audax steering. Bicycle handles. Double-cranked pedal shaft and axle in one. Rubber pedals, on plain bearings. Band brake applied by a foot lever. Bolted sliding spring. Piyskin saddle. Wrench. Oilcau. Spring top lubricators. Weight 74lbs. Width

40 in . The frame is simple yet peculiar. The large wheels face each other, and are sonnected by a double-cranked axle and pedals. A tube forms an arch resting on the bearings at the axle ends. At the top of this the head is fixed pointing forwards, whilst at right angles to it a backbone departs rearward, first rising high into an arch, and then dropping away to the rear wheel and fork as in a bicycle. The saddle is on the top of the arch.

Specialties. Mode of steering and entire frame of machine.


Remarks. The rider sits on the backbone, and drives direct upon the axle. To steer he leans to whichever side he wishes to turn; this throws the backbone over, and pushes the outer wheel round. It is good in principle, and well made. The rider steers by the inclination of his body only. It is also simple in construction, but requires more learning than the majority of other tricycles. When thoroughly mastered it runs well, and is a good hill-climber.

## CENTAUR No. 1.

Centadr Cfcle Co., West Orchard, Coventry.

## Leading Features. Open front. Rear steering. Single driving.

Description. Two 40in. and one 18in. wheel. Driving wheel 40 in ., running as 46 in . $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 48 and 24 , No. 11
butt-ended direct spokes. Iron hubs. Ball bearings to steering wheel, driver and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shaft, 6in. throw. Rubber pedals, plain. Chain driving. Pull-up lever double tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Width 38in., reducible to 29 in . by taking off the loose wheel. Weight 781bs. Hayfork frame, of weldless steel tube.

the centaur no. 1.
Price .. .. .. .. £ 1717 s . 0 d .
Sent out painted in two colours.
Exiras. Valise, 4s. 6d. Cradle spring, 7s. 6d. Plated fittings, 12s.
Remarks. A very well built machine of the ordinary type, has ball bearings throughout. (See Advertisement.)

CENTAUR No. 2.

## Centaur Cycle Co., West Orchard Works, Coventry,

Leading Features. Open front. Single driving. Rear steering.
Description. Two 40in. and one 18in. wheel. Driving wheel 40in., running as 44 in . ${ }_{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 48 and 24 , No. 11 butt-ended direct spokes. Iron hubs. Plain bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Spade handles. Double cranked pedal shaft, 6in. throw. Rubber pedals, plain. Chain driving. Pullup lever double tyre brake. Adjustable $\Gamma$ seat rnd. Elliptical spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Width 39in. reducible to 30 in . by taking off the loose wheel. Weight 86lbs. Hayfork frame.

$$
\text { PRICE .. .. .. .. } £ 1515 \mathrm{~s} .0 \mathrm{~d} .
$$

Sent out painted in two colours.
Remarks. A sound machine, slightly heavier than the No. 1, and with plain bearings in place of balls. (See Advertisement.)

## CENTAUR TANDEM SOCIABLE-D.D.

Centaur Cycle Co., West Orchard Works, Coventry.

the centaur tandem sociable.
Leading Features. Front steoring. Double driving with balance gear. Riders. placed tandem fashion, one behind the other.

Description. Two 48 in . and one 18 in . wheel. Driving wheels 48 in ., running as 42 in . ${ }_{8}^{2} \mathrm{in}$. rubbers. Crescent rims. 56 and 24 , No. 11 butt-ended direct spokes. Iron hubs, 6in. x 4in. Ball bearings to all wheels, and plain to crank shaft. Socket rudder head. Rack and pinion steering. Adjustable spade handles in front, and bicycle-style handles for rear rider. Double-cranked pedal shafts. Rubber pedals plain. Chain driving, and Centair double driving gear. Push lever double band (6in. x lin.) brake. Adjustable seat rods. Elliptical and Arab Cradle springs. Pan seat and Long-distance saddle. Footrests on frame. Adjustable wrenches. Oilcan. Width 40in. Weight 1351bs. The frame is of tubular steel, the fore part being of the loop pattera, whilst the sides drop down rearwards to hold the crank bearings for the rear rider, and from the centre a short tube departs carrying the seat rod socket. Side irons carry the bicycle handles for rear rider.

## Specialties. Plan of machine. Balance-gear verv similar to Pritchard's. <br> Price .. .. .. .. £27 10s. 0d. Sent out with plated fittings, rest painted in two colours.

Remarks. This is a first-class machine of the tandem type. Both riders drive by means of separate chains actuating one balance-gear. It is well put together, and is one of the simplest of the kind in the market. It may be termed half of a "Four-in-hand," a machine which I shall describe later on. (See Advertisement.)

CHALLENGE No. 1-C.D.
Singer \& Co., Challenge Works, Coventry.

the challenge no. 1.
Leading Features. Open front. Double front steering. Central driving Lever action. Folds for stowage.
Description. Two 28 in . and one 48 in wheel. Driving wheel 48 in ., running level. $\frac{7}{8} \mathrm{~m}$. rubbers. Crescent rims. 60 and 24, No. 12 direct butt ended spokes. Steel hubs. Ball bearings to all wheels. Socket rudder heads. Rack and pinion steering. Blood's patent double steering gear. Spade handles. Bicycle cranks. Singer's patent rubber pedals, plain. Challenge lever central driving. Eccentric tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests projecting in front of frame. Adjustable wrench. Oilcan. Width 38 in., reducible to 22 in . by the Challenge method. Weight 100 lbs . The frame consists of hollow forks over the driving wheel, with backbone descending almost to the ground, to the lower part of which is attached the rest of the frame as described on page 45.

Specialties. Challenge levers (page 65). Blood's patent double steering (page 63). Singer's rubber pedals (page 26). Challenge folding gear (page 45). Construction of frame. Harrington's enamel

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\text { PRICE } \because \quad . \because \quad . \quad . .
$$

Sent out with plated hubs, spokes, and handle fittings, rest painted in two colours, or enamelled plain black in Harrington's enamel.

Extras. Adjustable handles, 20s.; Cradle spring, 5s. ; all plated, £10.
Remarks. One of the earliest successful tricycles in the market; it has been much improved of late, and is now lighter, faster, and more rigid than it ever was before. The action is vertical and powerful, and the brake one of the best in use, whilst the central driving is another good point. It is well made and nicely sent out, but is notadapted for carrying muchluggage. (See Advertisement.)

CHALLENGE No. 2.
Singer \& Co, Alma Street, Coventry.

the challenge no. 2.
Leading Features. Open front. Rear steering.
Description. Two 44 in . and one 18 in . wheel. Driving wheel 44 in ., running level. $\frac{7}{8}$ in. and $\frac{3}{4}$ in. red rubbers. Crescent rims. 44 and 20 , No. 12 butt-ended direct spokes. Iron hubs, $5 \frac{1}{2} \mathrm{in} . \mathrm{x} 4 \mathrm{in}$. Parallel bearings to driver, and cones to steering wheel. Stanley rudder head. Rack and pinion steering. Spade handles. Double-cranked pelal shaft, running in plain bearings. Challenge rubber pedals on plain bearings. Chain driving. Double tyre brake applied by eccentric. Stayed brake bracket. Adjustable seat rod. Elliptical spring. Cushioned seat. Footrests on frame. Screw wrench. Oilcan. Valve lubricators. Weight 851 bs . Width 39in. Hayfork frame.

Specialties. Challenge pedals (page 26). Eccentric brake application, and stayed brake bracket. Harrington's enamel.
Price .. .. .. .. £18 0s. 0d.

Sent out with handles and fittings plated, rest enamelled in Harrington's enamel.

$$
\text { Extras. Balls to all parts, } £ 510 \text { s. ; to wheels only, } £ 3 .
$$

Remarks. This is a strong, soundly built machine of the common pattern, with sundry improvements in detail. (See Advertisement.)

## CHALLENGE No. 2, FOLDING.

Singer \& Co., Challenge Works, Coventry.

## Leading Features. Open front. Rear steering. Folding for stowage.

Description. Two 44in. and one 18in. wheel. Driving wheel 44in., running level. ${ }_{5}^{7}$ in. and $\frac{3}{4} \mathrm{in}$. red rubbers. Crescent rims. 44 and 20 , No. 12 butt-ended direct spokes. Iron hubs, $5_{2}^{1} \mathrm{in} . x 4 \mathrm{in}$. Parallel bearings to driver, and cones to steering wheel. Stanley rudder head. Rack and pinion steering. Spade handles. Double-cranked pedal shaft, running in plain bearings. Challenge rubber pedals on plain bearings. Chain driving. Double eccentric tyre brake. Adjustable seat rod. Elliptical spriag. Cushioned seat. Footrests on frame. Screw wrench. Oilcan. Valve lubricators. Weight 90 lbs . Width 29in., reducing to 22 in . by taking out the pedal shaft, raising a catch, and drawing the large wheels together. The frame consists of two tabes hinged together at the steering head, and running forward like a $V$, being kept apart by the seat support.

Specialties. Folding frame (Starley's patent, page 45). Challenge pedals (page 26). Harrington's enamel.
Price .. .. .. .. £19 10s̀. 0d.

Sent out with plated fittings, rest enamelled plain black in Harrington's enamel.
Remarks. This is easily folded, but when so, the wheels do not run parallel. It was one of the earliest folding machines in the market, and when running is an ordinary single driver. (See Advertisement.)

## CHALLENGE No. 7.

Singer \& Co., Alma Street, Coventry.
Leading Features. Open front. Rear steering. Built for use of ladies and youths.

Description. Two 32in. and one 14in. wheel. Driving wheel 32in., running level. $\frac{7}{8} \mathrm{in}$. and $\frac{5}{8} \mathrm{in}$. red rubbers. Crescent rims. 30 and 14, No. 12 direct spokes. Iron hubs, $4 \mathrm{in} . x$ 3in. Plain bearings to all parts. Socket rudder head, Kack and pinion steering. Spade handles. Double-cranked pedal shaft. Challenge rubber pedals. Chain driving. Double tyre eccentric brake. Adjustable seat rod. Scroll spring. Cushioned seat. Wrench. Oilcan. Valve lubricators. Weight 55lbs. Width 33in. Hayfork frame.

Specialties. Challenge rubber pedals (page 26). Harrington's enamel.

$$
\text { Price .. .. .. .. } \quad 10 \text { 0s. 0d. }
$$

Sent out painted in two colours, or enamelled plain black in Harrington's enamel.

Remarks. A sound machine of the ordinary type, suitable for the use of youths or ladies. (See Advertisement.)

## CHAMPION.

## A. Markham, 345, Edgware Road, London, W.

Leading Features. Open front. Rear steering. Single driving.
Description. Two 40 in . and one 17 in . wheel. Driving wheel $40 \mathrm{in} .$, running as 60 in . ${ }_{7}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$ rubbers. Crescent rims. 40 and 20 , No. 11 direct spokes. G.M. hubs. Ball bearings to all wheels, and plain to crank-shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pearshaped purchase handle. Double-cranked pedal shaft, 6in. throw. Rubber pedals, plain. Chain driving. Pull-up lever band brake. Adjustable seat rod. Elliptical spring. Cushioned seat. Footrests on frame. Adjustable wrench. Oilcan. Bell. Valise. Lock and chain. Width 39 in ., reducible to 33 in . by taking off the loose wheel. Weight 87lbs. Hayfork frame.

Price .. .. .. .. £12 12s 0d.

## Sent out painted in two colours.

Remarks. An ordinary single driver.

## CHAMPION FOLDER.

## A. Markhay, 345, Edgware Road, London, W.

Leading Features. Open front. Rear steering. Single driving. Folds for stowage.

Description. Two 50in. and one 17in. wheel. Driving wheel 50in., running as 44 in .7 in . and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 52 and 20, No. 11 direct spokes. G.M. hubs, $6 \mathrm{in} . \times 3 \mathrm{in}$. Ball bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 6 in . throw. Rubber pedals, plain. Chain driving. Pull-up lever (6in.) band brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Bell. Valise. Lock and chain. Two lamps. Width 39 in ., reducible to 12 in . by Markham's method. Weight 891 bs. The frame is a $V$ shaped hayfork.


THE CHAMPION FOLDER.
Specialties. Markham's folding arrangement (page 45).
Price .. .. .. .. £15 15s. 0d.
Sent out painted in two colours.
Remarks. An easily folded single driver, of sound material.

## CHARNWOOD.

The Charnwood Tricycle Co., Loughborough.
Leading Features. Open front. Rear steering. Single driving.
Description. Two 46 in . and one 18 in . wheel. Driving wheel 46 in ., running as 50 in . ${ }_{8}^{7} \mathrm{in}$. and ${ }_{4}^{\frac{3}{4} \mathrm{in} . ~ r u b b e r s . ~ C r e s c e n t ~ r i m s . ~} 50$ and 20 , No. 11 direct spokes. G.M. hubs, $6 \frac{1}{2}$ in. $x 3 \frac{1}{2}$ in. Coned bearings to steering wheel, plain to drivers and crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 6 in. throw. Rubber pedals, plain. Chain driving. Pull-up lever double tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Flat wrench. Oilcan. Valise. Width 39in., reducible to 32 in. by taking off the loose wheel. Weight 791 bs . Hayfork frame.

Price .. .. .. .. £13 10s. 0d.
Sent out with bright spokes and fittings, rest painted in black, lined gold.
Remarks. Sent out complete in crate. A fairly built, sound machine of the ordinary type, with no especial features.

## CHARNWOOD SPECIAL.

The Charnwood Tricycle Co., Loughborough.

## Leading Features. Open front. Rear steering. Single driving.

Description. Two 46 in . and one 18 in . wheel. Driving wheel 46 in , running as 50 in . $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 50 and 20, No. 11 direct spokes. G.M. hubs, $6 \frac{1}{2} \mathrm{in}$. $\times 3 \frac{1}{2} \mathrm{in}$. Ball bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pearshaped purchase handle. Double-cranked pedal shaft, 6 in. throw. Rubber bali pedals Chain driving. Pull-up lever double tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Flat wrench.

Oilcan. Valise. Width 39in., reducible to 32in. by taking off the loose wheel. Weight 75lbs. Steel hayfork frame.

$$
\text { Price .. .. .. .. } \quad £ 16 \text { 10s. 0d. }
$$

Sent out with plated spokes and fittings, rest japanned in two colours.
Remarks. Carefully built, and fitted with ball bearings all over. A very good machine of its class.

## CHEYLESMORE CLUB-D.D.

Coventry Machinists' Co., Cheylesmore, Coventry.

the cheylesmore club.
Leading Features. Open front. Rear steering. Double driving, with two chains.

Description. Two 44in. and one 20in. wheel. Driving wheels 44in., running level. ${ }_{\frac{7}{8}}^{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 44 and 20 , No. 13 Club spokes. Steel hubs, 47 in . x $3_{\frac{3}{3}}^{3} \mathrm{in}$. Coned bearings to steering wheel, balls to drivers and crank shaft. Socket rudder head. Rack and pinion steering. Spade handles. Double-cranked pedal sbaft, 6in. throw. Rubber pedals, plain. Double chain driving, and Cheylesmore double driving gear. Pull-up Cheylesmore swing-lever double tyre brake. Adjustable seat rod. Suspension spring. Pan seat. Pedals form footrests. Flat wrenches. Oilcan. Width 38 in . Weight 851 lbs . Hayfork frame of weldless steel tube, bent back at the fork ends.

Specialties. Club spokes (page 23). Cheylesmore double driving clutch (page 75). Cheylesmore suspension spring (page 49). Club ball bearings (page 37). Swing lever brake (page 97).
Price .. .. .. .. £22 10s. 0d.

Sent out with plated spokes and fittings, rest painted in two colours.
Extras. All plated, £7. Non-slipping tyres, 15s. Adjustable handles, 15 s . Balls to rudder wheel, 20s. Ball pedals, 20s. Cradle spring, 10s.

Remarks. One of the best exponents of rear steering in the market. It is beautifully made, and highly finished. One of these has been supplied to H.R.H. the Prince of Wales. (See Advertisement.)

## CHEYLESMORE CONVERTIBLE-D.D.

 Coventry Machinists' Co., Cheylesmore, Coventry.

THE CHEYLESMORE CONVERTIBLE.
Leading Features. Front steering. Double driving with balance gear, in both forms. Convertibility from a double to a single machine, and vice versâ.

Description. Two 48 in . and one 17 in . wheel. Driving wheels, 48 in ., running level. ${ }_{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 72 and 18 , No. 13 Club spokes. Steel hubs, 6 in . x $3 \frac{3}{4} \mathrm{in}$. Ball bearings to all wheels and crank shafts. Socket rudder head. Rack and pinion steering. Adjustable spade handles. Doublecranked pedal shafts, 5 in. and 6in. throw. Rubber pedals, plain. Chain driving, and Starley's patent double driving gear. Push lever band (8in. x 1in.) brake. Adjustable $\Gamma$ seat rod. Club suspension springs. Suspension seat and saddle. Footrests on frame. Flat wrenches. Oilcan. Width 74in., reducible to 38 in . Weight 140lbs. The frame is a circular fronted steel loop, the ends dropping down behind the axle to form safety stays. By taking out pins in the top and bottom of the frame and the crank and pedal shafts, the machine may be drawn apart and the wheel on the detached portion taken off and put on the projecting spindle, whilst the front bone can be taken out and put in the centre.

Specialties. Club spokes (page 23); Club suspension springs (page 49); Cheylesmore adjustable handles (page 59) ; Method of converting.
Price .. .. .. .. £34 13s. 0d.

Sent out with plated fittings, rest painted in two colours.
Extras. Plated cranks and steering rod, 50 s. ; all plated, $£ 1110 \mathrm{~s} . ;$ ball pedals, 40s. ; cradle spring, 7s. 6d.
Remarks. This is a beautifully constructed machine, and is convertinle into either a single or double machine at will, being a front steering double driver in both forms; in the single form being au ordinary three-track balance-geared machine. (See Alvertisement.)


THE CHEYLESMORE FOLDER.
Leading Features. Open front. Kear steering. Double-driving with two chains. Folds for stowage.

Description. Two 44 in . and one 20 in . wheel. Driving wheels 44 in ., running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 44 and 20 , No. 13 Club spokes. Steel hubs, $4 \frac{7}{8} \mathrm{in} . \times{ }_{3}^{3} \mathrm{in}$. Coned bearings to steering wheel, and balls to drivers. Socket rudder head. Rack and pinion steering. Spade handles. Doublecranked pedal shaft, 6in. throw. Rubber pedals, plain. Double chain driving, and Cheylesmore clutch double-driving gear. Cheylesmore swing lever double tyre brake. Adjustable $\Gamma$ seat rod. Suspension spring. Pan seat. Pedals form footrests. Handy wrench. Oilcan. Width 38 in., reducible to 27 in . by the Cheylesmore method. Weight 901 lbs . The frame is of weldless steel tube of the hayfork type, with vertical forks and alterations in detail, as given on page 46.

Specialties. Club spokes (page 23). Cheylesmore driving clutch (page 75). Suspension spring (page 49). Swing lever brake (page 97). Cheylesmore method of folding (page 46). Cheylesmore adjustable handles-extra (page 59).

$$
\begin{array}{llllllll}
\text { Price .. .. .. } & \text {.. } & \text { 0s. } & 0 \mathrm{~d} .
\end{array}
$$

Sent out with plated spokes and handle fittings, rest painted in two colours.
Extras. Non-slipping tyres, $15 \mathrm{~s} . ;$ adjustable handles, 15 s .; balls to back wheel, 20 s , ; ball pedals, 20s.; Cradle spring, 10s.
Remarks. The machine is beautifully made throughout, and has the usual peculiarities in action of its class, whilst by the folding arrangement the turning of a couple of screws enables the machine to be at once folded into a narrow space, and wheeled when folded, the wheels remaining parallel. (See Advertisement.)

## CHEYLESMORE SOCIABLE-D.D.

## The Coventry Machinists' Co., Cheylesmore, Coventry.

Leading Features. Front steering. Double driving with balance gear. For two riders.

Description. Twn 48 in . and one 17 in . wheel. Driving wheels 48 in ., running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 52 and 17, No. 13 Club spokes. Steel hubs, $6 \mathrm{in} . \mathrm{x} 3 \frac{3}{1} \mathrm{in}$. Ball bearings to all wheels and cran's shafts. Socket
rudder head. Rack and pinion steering. Cheylesmore adjustable spade handles. Double cranked pedal shafts, 5iu. and 6in. throw. Rubber pedals, plain. Chain driving, Cheylesmore clutch action to lady's side, and Starley's patent double driving gear. Push lever band (8in. x lin.) brake. Adjustable $\Gamma$ seat rods. Suspension springs. Pan seat and suspension saddle. Footrests on frame, or pedals on lady's side form footrests. Flat wrenches. Oilcan. Width 74in. Weight 140lbs. The frame is a broad loop of weldless steel tube, with side tilt rods behind.


THE CHEYLESMORE SOCIABLE.
Specialties. Club spokes (page 23). Cheylesmore clutch action to lady's crank (page 75). Suspension spring (page 49). Cheylesmore adjustable handles (page 59).

$$
\text { Price .. .. .. .. } £ 30 \text { 0s. 0d. }
$$

Sent out with plated hubs, spokes, and handle fittings, rest painted in two colours.

Extras. Plated rudder and cranks, 50s. Plated all over, £11 10s.0d. Ball pedals, 40 s.

Remarls. A very finely built sid3-by-side sociable, is light, rigid, and fast. It is vertically built, and gains a point in having the crank shaft on the lady's side fitted with Cheylesmore clutch. so that the farr rider may keep her feet still when her services for propulsion are not required. (See Advertisement.)

## CLUB.

The Coventry Machinists' Co., Cheylesmore, Coventry.
Leading Features. Open front. Rear steering. Single driving.
Description. Two 36 in . and one 17 in . wheel. Driving wheel 36 in , running evel. $\frac{3}{4}$ in. and 5 sin . rubbers. Crescent rims. 46 and 20, No. 13 direct spokes. Steel hubs, $47{ }_{8}^{7} \mathrm{in} . \times 3 \frac{3}{x} \mathrm{in}$. Coned bearings to steering wheel, plain to driver and crank shaft. Socket rudder head. Rack and pinion steering. Spade
handles. Double-cranked pedal shaft, 5in. throw. Rubber pedals, plain. Chain driving. Push lever double tyre brake. Adjustable 「 seat rod. Suspeusicn spring. Pan seat. Footrests on trame. Flat wrench. Oilcan. Width 36 in ., reducible to 30 in . by taking off the loose wheel. Weight 7olbs. Hayfork frame.

Specialties. Suspension spring (page 49).


THE CLUB.

$$
\text { Price .. .. .. .. } \begin{aligned}
& \text {.. } 12 \\
& \text { 0s. }
\end{aligned}
$$

Sent out with plated handle fittings, rest painted in two colours.
Remarks. A soundly built machine for the use of youths and ladies. It has no special features, being an ordinary rear steering single driver. (See Advertisement.)

## COGENT.

Henry Clarise, Cogent Works, Darlington St., Wolverhampton.
Leading Features. Open front. Rear steering. Single driving.
Description. Two 44 in . and one 18 in . wheel. Driving wheel 44 in ., running level. ${ }_{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 52 and 20 , No. 11 direct spokes. G.M. hubs, $5 \frac{1}{2} \mathrm{in} . \times 4 \frac{1}{4} \mathrm{in}$. Coned bearings to steering wheel, plain to drivers and crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, $5 \frac{3}{4} \mathrm{in}$. throw. Rubber pedals, plain. Chain driving. Rack and pinion double tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Flat wrench. Oilcan. Bell. Valise. Two lamps. Width 36in., reducible to 30 n . by taking off the loose wheel. Weight 801 bs . The frame is a hayfork, of 13 in . tube.
Price .. .. .. .. £14 0s. 0d.

Sent out with bright spokes and handle fittings, rest painted in two colours.
Extras. Larger wheels, 5 s. per inch; balls to large wheels 40 s., to steering wheel 10s., to crank 10s., to pedals 20s. ; Cradle spring, 10 s.; double driving with two chains, 40 s . ; plated bright parts, 20 s .

Remarks. This is a sound, well-constructed machine of the usual open fronted variety.

## COLUMBIA-D.D. <br> The Pope Manufacturing Co., Boston, Mass., U.S.A.

## Leading Features. Front steering. Double driving by balance gear.

$D$ scription. Two 50 in . and one 18 in . wheel. Driving wheels $50 \mathrm{in} .$, running as $46 \frac{3}{7}$ in. $\frac{7}{8}$ in and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 and 18, No. $11 \frac{1}{2}$ direct doubly butted spokes. Steel hubs, 6in. x 3 in . Columbia ball bearings to all wheels, crank shaft and pedals. Universal joint to bearings. Stanley rudder head. rack and pinion steering. Adjustable spade vulcanite handles. Double cranked pedal shaft, 6 in . throw. Rubber pedals. Chain driving, and Whitehead compensating double driving gear. Push lever band brake. Adjustable $\Gamma$ seat rod. Arab Cradle spring. Long distance saddle. Footrests on frame. Wrench. Oilcan. Valise. Width 38 in . Weight 95 lbs . The frame is a tubular steel lcop, on the lines of the " National," with the sides dropping over behind to form the tilt rods.

Specialties. Whitehead compensating gear. Columbia ball pedals (somewhat like Bown's). Vulcanite handles.

Price .. .. .. .. .. £37 10s. 0d.
Sent out with plated fittings, rest enamelled in gold and black.
Remarlis. This machine has just been placed on the American market. It is machine-made throughout, so should be a good thing, more especially as the lines of the last year's "National" bave been taken on which to build it. It has of course yet to stand the test of time, but from all accounts it is a good article. It is manufactured for the Pope Co. by the Weed Sewing Machine Company.

## COMPRESSUS CONVERTIBLE-D.Di

Thos. Moore, Kennington Park Corner, London, S.E.


As a Double.


As a Single.

THE COMPRESSUS CONVERTIBLE.
Leading Features. Double front steering. Open front. Independent double driving. Collapsible into a single machine. Two tracks in each form.

Description. Two 50 in . and two 20 in . wheels. Driving wheels 50 in ., running level. ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 50 and 20 , No. 11 direct spokes. G.M. hubs. Ball bearings to steering wheels, plain to drivers and crank shafts. Socket rudder heads. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handles. Double-cranked pedal shafts. Rubber pedals, plain. Double chain driving. Push lever band brake. Adjustable seat rods. C springs. Cushioned seats. Flat wrench. Oilcan. Width 555in., reducible to

42 in. by telescoping one half into the other. Weight 1301 bs . The frame is on the double-loop plan, but the ends are made telescopic and the steering wheels are attached at each fore-corner instead of in the centre.

Specialties. Frame and compressibility.

$$
\text { Price .. .. .. .. } 25 \text { 0s. 0d. }
$$

## Sent out painted in two colours.

Remarks. This is a most extraordinary machine, being built so that by lowering one seat and turning the pedals back against the frame one half can be telescoped into the other. Thus the rider can pick up or drop a friend, and alter his machine accordingly. It is an ingenious affair, but being very heavy as a single machine will hardly take, I fancy, with the generality of the public.

## CONDOR—D.D.

## William Lewis, Temfest Works, Wolverhampton.



THE CONDOR.
Leading Features. Front steering. Double driving with one chain.
Description. Two 46 in . and one 18in. wheel. Driving wheels 46 in ., running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 and 20 , No. 11 direct spokes. G.M. hubs, $5 \frac{1}{2} \mathrm{in} . \mathrm{x} 4 \mathrm{in}$. Æolus ball bearings to wheels, plain to crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shaft, 5in. throw. Rubber pedals, plain. Chain Ariving. Lewis's double driving gear. Push lever band ( $4 \frac{1}{2} \mathrm{in}$. x lin.) brake. Adjustable seat rod. Elliptical spring. Tricycle saddle. Footrests on frame. Flat wrench. Bell. Oilcan. Lamp. Valise. Width 35in. Weight 9 lbs. Loop frame.

- Specialties. Lewis's double driving gear.

Price .. .. .. .. £16 10s. 0d.
Sent out:with plated hubs and handles, rest painted in two colours.
Remarks. Soundly constructed. One of the cheapest front steerers in the market. (See Advertisement.)

## COVENTRY CONVERTIBLE-D.D.

D. Rudge \& Co., Rudge Wheel Works, Coventry.


THE COVENTRY CONVERTIBLE.

Leading Feutures. Easy convertibility. Compactness. Two tracks as a single machine. Double steering in both forms. Independent double driving.

Description. Two 48 in . and two 20in. wheels. Driving wheels 48 in ., running level. 7 in. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 52 and 20 , No. 11 direct spokes. G.M. hubs. Rudge's ball bearings to steering wheels, plain to drivers, and Rudge's ball to crank shaft. Stanley rudder heads. Rack and pinion double steering. Adjustable spade steering handle, and pear-shaped purchase handles. Double-cranked pedal shafts, 6 in. throw. Rubber pedals, plain. Independent chain driving. Very powerful push lever band (6in. $\frac{7}{8} \mathrm{in}$.) brake. Adjustable seat rods. S springs. Pan seat and Brooks' flexible saddle. Footrests on frame. Flat wrench. Oilcan. Valise. Width 56in., reducible to $29 \frac{1}{2}$ in. by taking off two nuts, knocking out a pin and removirig one half. Weight 1351 lbs. The frame consists in the single part of two tubes arranged thus- to which the forks of the rudder wheels, rods carrying the crank bearings, \&c., are attached. The second portion is the same, but without the long side tube, and is fitted with a hinge and taper bolt, with cross stay for attachment.

Specialties. Rudge's ball bearings (pages 35 and 36). Method of conversion. Harrington's enamel (extra). Plan of frame. Coventry double steering (page 63). PRICE .. .. .. .. £26 10s. 0d.

## Sent out with plated fittings, rest painted in two colours.

Extras. Harrington's $\in$ namel, 10s. Balls to driving wheels, 40s. Rudge's ball pedals, 40s.

Remarks. This machine is more readily converted from one form to another than any other in the market, and will go into a smaller space. It is best in its single form, when it makes but two tracks, and runs with remarkable ease and steadiness. As a double it shows to best advantage when the riders are of nearly equal calibre. It runs well, and the action being very vertical it takes hills well both up and down. It is best when fitted with saddles and $\Gamma$ pins. (See Advertisement.)

## COVENTRY PHGENIX SOCIABLE-D.D.

## Coventry Pherix Tricycle Co., Much Park Street, Coventry.



THE COVENTRY PHGENIX SOCIABLE.
Leading Features. Front steering. Double driving by balance gear. Cranks set at quarter section, to avoid dead points.
f: Description. Two 48 in . and one 18 in . wheel. Driving wheels 48 in ., running as 43 in . 1 in . and $\frac{7}{8} \mathrm{in}$. red rubbers. Crescent rims. 52 and 20 , No. 10 direct spokes. G.M. hubs, 6 in. x tin. Ball bearings to all wheels. Socket rudder head. Rack and pinion steering. Spade handles. Double-cranked pedal shaft in quarter section, running in plain bearings. Rubber pedals on plain bearings. Chain driving, and Pritchard's automatic double driving gear.

Lever band brake. Adjustable seat rods. Elliptical spring. Pan seats. Footrests on frame front. Spring top lubricators. Weight $1501 b s$. Width 58 in . The frame is a double loop in shape, running from the main tube which encloses the axle. It is all of weldless steel tube, and has a single stout safety tube behind.

Specialties. Pritchard's patent driving gear (page 82). Cranks set at quarter sections.

$$
\text { Price } \quad . \quad . \quad \because \quad . \quad \text { £26 10s. 0d. }
$$

Sent out neatly painted in two colours.
Extras. Adjustablejhandles, 10s. 6d.
Remarks. Strongly built, and runs well. The brake is powerful, and the set of the cranks in quarter sections gets over the dead point, and gives a steady continuous run.

## COVENTRY PHENIX No: 2-D.D.

Coventry Pheenix Tricycle Co., Much Park Street, Coventry.
Leading Features. Front steering. Double driving by balance gear. Open behind for convenience in pushing.

Description. Two 48 in . and ons 18 in . wheel. Driving wheels 48 in ., running as 43 in . $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. red rubbers. Crescent rims. 48 in . and 18 in ., No. 11 direct spokes. G.M. hubs, 6 in. x 4 in. Ball bearings to all wheels. Stanley rudder head. Rack and pinion steering. Spade handles. Double-cranked pedal shaft, running in plain bearings. Rubber pedals on plain bearings. Chain driving, and Pritchard's patent double-drıving gear. Lever band brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame front. Spring top lubricators. Weight 97 lbs . Width 38 in . The frame is the same as that of No. 1, but there are two light solid back stays, one on each side.

Specialties. Pritchard's patent driving gear (page 82).

$$
\begin{aligned}
& \text { Price } \\
& \text { Sent out neatly painted in two colours all over. } \\
& \text { Extras. Adjustable handles, } 7 \mathrm{~s} .6 \mathrm{~d} .
\end{aligned}
$$

Remarks. This is practically the same machine as the No. 1 in running and general detail, but the stays are placed one on each side, so as to give freedom to the legs when walking behind and pushing up hills, the usual central back stay being very much in the way, and extremely awkward.

## COVENTRY PHENIX No. 1-D.D.

Coventry Pheenix Tricycle Co., 132, 133, and 131, Much Park Street, Coven try

the Coventry phenix no. 1.

Leading Features. Front steering. Double driving with balance gear.
Description. Two 48 in . and one 18in. wheel. Driving wheels 48 i ., running as 43 in . ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. red rubbers. Crescent rims. 48 and 18 , No. 11 direct spokes. G.M. hubs, 6 in. x 4in. Жolus ball bearings to all wheels. Socket rudder head. Rack and pinion steering. Spade handles. Double-cranked pedal shaft, running in plain bearings. Rubber pedals on plain bearings. Chain driving, and Pritchard's patent double driving gear. Lever strap brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Spring top lubricators. Weight 97 lbs . Width 38 in . The frame is of the loop variety, the sides being made of flat Bessemer steel, and the backbone and backstay of weldless steel tube.

Specialties. Pritchard's patent balance gear (page 82).
Price .. .. .. .. £20 0s. 0d.

Sent out painted all over in two colours.
Extras. Adjustable handles, 7s. 6d.
Remarks. This is soundly put together, and will drive both wheels equally well either forwards or backwards. It has the relative position of the pedals fairly well placed, and runs easily and climbs hills well. It is not a heavy machine of its class.

## COVENTRY PHCENIX No. 4-D.D.

Coventry Phenix Tricycle Co., Much Park Street, Coventry.

the coventry pheenix no. 4.
Leading Features. Front steering. Double driving, with balance gear. All clear behind.

Description. Two 48 in . and one 18 in . wheel. Driving wheels 48 in ., running as 43 in . $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. red rubbers. Crescent rims. 48 and 18 , No. 11 direct spokes. G.M. hubs. Ball bearings to all wheels. Stanley rudder head. Rack and pinion steering, Spade handles. Double cranked pedal shaft, running in plain bearings. Rubber pedals ou plain bearings. Chain driving, and Pritchard's patent double driving gear. Lever band brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame front. Spring top lubricators. Weight

961 lbs . Width 38in. The frame is a loop of weldless steel tube throughout, the axle running through the upper main tube.

Specialties. Pritchard's patent balance gear (page 82).
Price .. .. .. .. £20 5s. 0d.
Sent out painted all over in two colours.
Extras. Adjustable handles, 7s. 6d.
Remarks. This is the same as the Nos. 1 and $\dot{2}$, but has tubular frame and only one safety rod, which is placed on one side for convenience when walking.

## COVENTRY PHENIX No. 5-D.D.

## Coventry Phenix Tricycle Co., Much Park Street, Coventry.

Leading Features. Front steering; for three riders, all facing front, and all working. Double driving by balance gear.

Description. Two 48 in . and one 18 in . wheel. Driving wheels 48 in ., running, as 43 in . lin. and $\frac{7}{8} \mathrm{in}$. red rubbers. Crescent rims. 48 and 18 , No 10 direct spokes. G.M. nubs, 6 in. x 4in. Ball bearings to all wheels. Socket rudder head. Rack and pinion steering. Spade handles. Double cranked pedal shaft, running in plain bearings. Rubber pedals on plain bearings. Chain driving. Pritchard's patent double driving gear. Lever band brake. Adjustable seat rods. Elliptical springs. One saddle and two pan seats. Footrests on frame. Spring top lubricators. Weight 1601bs. Width 58in. The frame is of weldless. tube, like that of the Sociable, but has a seat placed centrally, and a toothed wheel in centre of driving shaft, and bicycle cranks and pedals for rear rider.

Specialties. Pritchard's patent double driving gear (page 82). Built for threeriders, all to drive.

Price .. .. .. .. £30 0s. 0d.
Sent out painted all over in two colours. Extras. Adjustable handles, 12s. 6d.
Remarks. The third rider is placed in the exact centre of the machine, behind the two front riders, the power being connected by a chain wheel fixed in the middle of the crank, which is driven by the chain wheel and endless chain, worked by the back rider, the cranks and peduls being exactly the same as in a bicycle. There is an 8 in. wheel behind, with a $\frac{5}{8} \mathrm{in}$. rubber, which acts as a safety wheel when required.

## COVENTRY ROTARY No. 1.

## D. Rudge \& Co., Rudge Tricycle Works, Crow Lane, Coventry.

Leading Features. Open front. Double steering. Single driving. Stability with narrowness. Central gear. Two tracks.
Description. Two 20 in . and one 48 in . wheel. Driving wheel 48 in ., running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. . Crescent rims. 72 and 20, No. 11 direct spokes. G.M. hubs. Rudge's ball bearings to all wheels and cranks. Stanley rudder heads. Rack and pinion double steering. Adjustable spade steering handle, and pear-shaped purchase handle. Bicycle cranks, adjustable throw. Rubber pedals, plain. Central chain driving. Push lever band (6in. $x^{7} \frac{7}{8} \mathrm{in}$.) brake. Adjustable $\Gamma$ seat rod. $S$ spring. Long-distance saddle. Coventry footrests. Flat wrench. Oilcan. Valise. Width 30in. Weight 75lbs. The frame consists of three weldless steel tubes arranged thus Steering wheels are at each end of the long side tube, the driver on the end of the tube at right angles to it, whilst the third tube drops down forwards and carries the pedal cranks:

Specialties. Coventry double steering (page 63). Rudge's ball bearings (pages: 35 and 36). Arrangement of frame. Harrington's enamel, extra.
Price .. .. .. .. £21 0s. 0d.

Sent out with plated heads and handle fittings, rest painted in two colours.


THE COVENTRY ROTARY NO. 1.
Extras. Tangent wheels and hollow rims, 40s.; Harrington's enamel, 5s.; non-slipping tyres, 7s. 6d. ; Cradle spring, 10s.; ball pedals, 20s.

Remarks. Although so narrow, this machine runs very steadily and firmly. It makes but two tracks and runs with great ease, the action being fully vertical. Its narrowness makes it very handy and easy of stowage. Built as a racer, it weighs from 50 to 55 lbs , and is very fast. It was on one of these machines that Lowndes accomplished 50 miles on the road last year in 3 h .47 m .40 s . (See Advertisement.)

## COVENTRY ROTARY No. 2.

## D. Rudge \& Co., Crow Lane, Coventry.

Leading Features. Open front. Double steering. Two tracks. Single driving. Ease of stowage.

Description. Two 20 in . and one 48 in . wheel. Driving wheel 48 in ., running level. ${ }^{7} \mathrm{i}$ in. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 72 and 20, No. 11 direct spokes. G.M. hubs. Rudge's ball bearings to steering wheel, plain to driver, and balls to crank shaft. Stanley rudder heads. Rack and pinion steering. Adjustable spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 6 in . throw. Non-slipping rabber pedals, plain. Chain driving. Push lever band ( $6 \mathrm{in} . \times \frac{7}{8} \mathrm{in}$.) brake. Adjustable $\Gamma$ seat rod. S spring. Pan seat. Footrests on frame. Flat wrench. Oilcan. Valise. Width 29in. Weight 85lbs. The frame is similar to that of the No. 1, but in place of the central tube, side rods of bar iron depend from the main frame, and carry a double-cranked shaft of the ordinary type.

Specialties. Peculiar construction. Rudge's ball bearings (pages 35 and 36). Coventry double steering (page 63).

the coventry_rotary no. 2.

$$
\text { Price .. .. .. .. } £ 20 \text { 0s. } 0 \text { d. }
$$

Sent out with plated heads and handle fittings, rest painted in two colours.
Extras. Tangent wheels and hollow rims, 40s.; Harrington's enamel, 5s.; non-slipping tyres, 7s. 6d.; Cradle spring, 10s.; ball bearings to driver, 20s.; to pedals, 20 s .

Remarks. This machine has all the advantages of the last, but is rather heavier, owing to its construction, and may be used by ladies as well as gentlemen, which cannot be done with the No. 1 very well. A dress guard is fitted, if desired, and for sole use by ladies it is built smaller throughout and is very suitable. (See Advertisement.)

COVENTRY TRIUMPH No. 2.
Warman, Laxon \& Youett, Albion Mills, West Orchard, Coventry.


THE COVENTRY TRIUMPH No. 2.

## Leading Features. Open front. Rear steering. Single driving.

Description. Two 40in. and one 20in. wheel. Driving wheel 40 in ., running level. ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 50 and 20 , No. 10 direct spokes. G.M. hubs, $6 \mathrm{in} . \times 4 \frac{1}{2} \mathrm{in}$. Coned bearings to steering wheel, plain to driver and crank shaft. Stanley rudder head. Rack and pinion steering. Spade steer, ing handle, and pear-shaped purchase handle. Double-cranked pedal shaft$5 \frac{1}{2} \mathrm{in}$. throw. Detachable rubber pedals, plain. Warman's patent chain driving. Pull-up lever double tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Flat wrench. Oilcan. Width 36in., reducible to 29in. by taking off the loose wheel. Weight 85lbs. Hayfork frame.

Specialties. Warman's patent driving chain (page 69).

$$
\text { Price .. .. .. .. } £ 15 \text { 10s. 0d. }
$$

Sent out with bright spokes and handle fittings, rest painted in two colours.
Remarks. A strong, open fronted machine. This was onej of the first machines built on these lines. It will stand knocking about.

## COVENTRY TRIUMPH No. 1.

## Warman, Layon, \& Youett, Albion Mills, Coventry.

Leading Features. Open front. Rear steering. Single driving. Unequal wheels.

Description. $50 \mathrm{in} ., 30 \mathrm{in}$. and 20 in . wheels. Driving wheel 50 in ., running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 50,30 and 20, No. 10 direct spokes. G.M. hubs, 6 in. $\times 4 \frac{1}{2}$ in. Coned bearings to steering wheel, plain to driver and crank shaft. Stauley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double cranked pedal shaft, $5 \frac{1}{2}$ in. throw. Detachable rubber pedals, plain. Warman's patent chain driving. Pull-up lever back wheel tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Flat wrench. Oilcan. Width $35 \mathrm{in} .$, reducible to 29 in . by taking off the loose wheel. Weight 88lbs.- Hayfork frame.

Specialties. Warman's patent driving chains (page 69).
Price .. .. .. .. £15 10s. 0d.
Sent out with bright spokes and handle fittings, rest painted in two colours.
Remarks. A strong soundly built machine, of the now rather uncommon, unequal wheeled variety.

## COVENTRY ZEPHYR.

The Zephyr Bicycle and Tricycle Co., Lower Ford Street, Coventry.


THE COVENTRY ZEPHYR.
Leading Features. Open front. Rear steering. Single driving.
Description. Two 40 in . and one 26 in . wheel. Driving wheel 40 in ., running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 40 and 20, No. 10 direct spokes. G.M. hubs, $6 \mathrm{in} . \mathrm{x} 4 \mathrm{in}$. Ball bearings to steering wheel, plain to driver, and ball to carrier and crank shaft. Socket rudder head. Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shaft, 6in. throw. Rubber pedals, plain. Chain driving. Push lever double tyre brake, with holder. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Valise. Width 37in. Weight 80lbs. Hayfork frame, of weldless steel tube.

Specialties. Rob Roy brake holder (page 99).

$$
\text { Price .. .. .. .. £ } 18 \text { 10s. 0d. }
$$

Sent out with polished hubs and handle fittings, rest painted in two colours.
Extras. Cradle spring, 7s. 6d.
Remarks. A sound strongly built machine, of the best materials, containing good work throughout. (See Advertisement.)

## COVENTRY ZEPHYR DOUBLE DRIVER-D.D.

## The Zephir Tricycle Co., Lower Ford Street, Coventry.

Leading Features. Front steering. Double driving, with balance gear. Excellent brake.

Description. Two 46 in . and one 20in. wheel. Driving wheels 46 in ., running level. ${ }_{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 and 20, No. 10 direct spokes. G.M. hubs, $6 \mathrm{in} . \mathrm{x} 4 \mathrm{in}$. Ball bearings to steering wheel, rollers to driving shafi, and plain to crank shaft. Socket rudder head. Rack and pinion steering. Adjustable spade handles. Double cranked pedal shaft, 6in. throw. Rubber pedals, plain. Chain driving, and Starley's patent double driving gear. Push
lever band (6in. x $\frac{3}{4}$ in.) brake, with holder. Adjustable 「 seat rod. Arab Cradle spring. Tricycle saddle. Footrests on frame. Flat wrench. Oilcan. Width 39 in . Weight 901 lbs . The frame is of the loop variety, and is constructed of gracefully bent steel bars.

Specialties. Brake holder (page 99). Starley's balance gear (page 80 ).

$$
\begin{array}{llllll}
P_{\text {bice }} . . & \text {.. .. } & \text { 0s. }
\end{array}
$$

Sent out with plated fittings, rest painted in two colours.
Extras. Roller pedals, 30s. ; balls to crank shaft, 30s.
Remarlis. A sound, reliable, well built machine of the now popular "Salvo" pattern. It is well suited for all kinds of work, and the action is well arranged. (See Advertisement.)

## CURRET.

Wolverhampton Manufacturing Co., Waterloo Road North, Wolverhampton. Leading Features. Open front. Rear steering. Single driving.
Description. Two 50 in . and one 20 in . wheel. Driving wheel 50 in ., running level. ${ }_{5}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 72 and 20 , No. 11 direct spokes. G.M. hubs, 5in. x $4 \frac{1}{2} \mathrm{in}$. Plain bearings to driver, and cones to steering wheel. Stanley rudder head. Rack and pinion steering. Spade handles. Duablecranked pedal shaft, running in plain bearings. Rubber pedals, on plain bearing. Chain driving. Back wheel spoon brake. Adjustable seat rod. Elliptical spring. Cushioned seat. Foo rests on frame. Wrench. Oilcan. Cup lubricators. Weight 86 lbs . Width 38 in ., reducing to 30 in . by taking off the loose wheel. Hayfork frame.

$$
\text { Price .. .. .. .. } 10 \text { 0s. 0d. }
$$

Sent out painted all over, with bright steering rack. Extras. Ball bearings, 50 s .

## DALBY-D.D.

J. P. Dalby, Whitehall Tricycle Works, 3, Whitehall Road, Leeds.

Leading Features. Front steering. Double driving with clutch gear. Lever action. Hand and foot motion.

Description. Two 46 in . and one 20 in . wheel. Driving wheels 46 in ., running level. $\frac{7}{8}$ in. rubbers. Crescent rims. 56 and 24 , No. 11 direst spokes. G.M.
 Stanley rudder head. Rack and pinion steering. Adjustable spade handles. Double cranked axle shaft. Rubber pedals, plain. Lever driving, and sliding friction clutch double driving gear. Push lever double tyre brake. Adjustable $\Gamma$ seat rod. Arab Cradle spring. Long distance saddle. Footrests on frame. Adjustable wrench. Oilcan. Width 39in. Weight 96lbs. The frame is of weldless steel tube, of the loop variety.

Specialties. Sliding friction clutches for double driving. Dalby lever gear (addenda). Spring catch adjustable handles (addenda). Hand gear (addenda).
Price .. .. .. .. £21 0s. 0d.

Sent out painted in two colours.
Remarks. I have not yet been able to see this machine, as it has but just been placed on the market. The main feature about it, however, is the connection of the handles with levers attached by spindles to the pedal levers in such a manner that the arms pull against the legs, and so utilise all power for driving purposes. (See Advertisement.)

## DALBY FOLDER.

[^1]Description. Two 40 in . and one 20in. wheel. Driving wheel 40 in ., running level. $\frac{7}{8}$ in. and $\frac{3}{4}$ in. rubbers. Crescent rims. 56 and 24 , No. 11 direct spokes. Bown's bail bearing hubs. Ball bearings to all wheels, and plain to crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shaft, sin. throw. Rubber pedals, plain. Chain driving. Pull-up lever spoon brake. Adjustable $\Gamma$ seat rod. Arab Cradle spring. Long-distance saddle. Footrests on frame. Flat wrench. Oilcan. Width 39in., reducible to 22 in . by patent arrangement. Weight 901 bs . The frame is of the hayfork pattern.

Specialties. Spring clutch handles (addenda). Dalby folding arrangement (addenda).

$$
\text { Price } \underset{\text { Sent out painted in two colours. }}{£ 20 \text { s. } 0 \text { d. }}
$$

Remarks. This is a new introduction, and I have not seen it yet, but the inventor is erecting large works in Leeds for its manufacture. The folding plan is to release the crank shaft, and then fold the two large wheels round the steering wheel, and the saddle being turned back to rest between them, the wheels run straight when folded. (See Advertisement.)


Leading Features. Open front. Rear steering. Double driving.
Description. Two 50 in . and one 20 in . wheel. Driving wheels 50 in ., running level, $\frac{7}{8} \mathrm{i}$ ic. and $\frac{3}{2} \mathrm{in}$. rubbers. Crescent rims. 54 and 24 , No. 11 direct spotes. G.M. hubs, $6 \frac{1}{2} \mathrm{in} . \times 4 \mathrm{in}$. Coned bearings to steering wheel, plain to drivers and crank shaft. Stanley rudder head. Rack and pinion steering. Spade handles. Double cranked pedal shaft, $5 \frac{1}{2} \frac{1}{2}$.' throw. Non-slipping rubber pedals, plain. Chain driving. Push lever double band (öin. x $\frac{5}{5} \mathrm{~m}$.) brake. Aảjustable seat rod. Two C springs. Pan seat. Footrests on frame. Flat wrench. Oilcan. Valise. Width $38 i n$. Weight $901 b s$. Hayfork frame.

Specialties. Double band brake. Machine built.
Price .. .. .. .. £16 16s. 0d.

Sent out with plated bubs and handle fittings, rest painted in two colours.
Remarks. This mach ne is made throughout of best materials and by the most improved machinery on the interchangeable system, and cannot be surpassed for quality.

## DELTA DOUBLE DRIVER-D.D.

The Birmingham Syarl arys Co., Small Heath, Birmingham.
Leading Features. Open front. Rear steering. Double driving with two chains.

Description. Two 50 in . and one 20 in . wheel. Driving wheels $50 \mathrm{in} .$, running level. ${ }_{8}^{7} \mathrm{in}$. and ${ }_{4}^{3} \mathrm{in}$. rubbers. Crescent rims. 54 and 24, No. 11 direct spokes. G.M. hubs., $6 \frac{1}{2}$ in. $x 4 i n$. Coned bearings to steering wheel, plain to drivers and crank shaft. Stanley rudder head. Rack and pinion steering. Spade handles. Double-cranked pedal shaft, $5 \frac{1}{2} \mathrm{in}$. throw. Non-slipping rubber pedals, plain. Double chain driving, and Delta clutch double driving gear. Push lever double band (5in. x 5 in .) brake. Adjustable seat rod. Two C springs. Long-distance saddle. Pedals form footrests. Flat wrench. Oilcan. Valise. Width 38in. Weight 921 lks . Hayfork frame.

Specialties. Double band brake. Machine construction. Delta driving clutch (page 76).

$$
P_{\text {Rice }} . . \quad . . \quad . . \quad . . \quad . . \quad £ 18 \text { 18s. 0d. }
$$

Sent out with plated spokes and handle fittings, rest painted in two colours.
Remarks. Like the last, a beautifully built machine. Drives both wheels forwards but not backwards, and pedals form instant footrests.

## DESIDERATUM.

## Desideratum Bicycle Co., Stewart Street, Wolverhampton.

Leading Features. Open front. Rear steering. Single driving.
Description. Two 40 in . and one 18 in . wheel. Driving wheel 40 in ., running level. ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 52 and 20 , No. 11 direct spokes. G.M. hubs, 6in. x 5in. Plain bearings throughout. Stanley rudder head. Rack and pinion steering. Spade haudle. Pear-shaped purchase handle. Double-cranked pedal shaft. Rubber pedals. Chain driving. Double tyre brake. Adjustable seat rod. Elliptical spring. Cushioned seat. Footrests on frame. Wrench. Oilcan. Valve lubricators. Weight 8tlbs. Width 39in. Hayfork frame.
Price .. .. .. .. £12 12s. 0d.

Sent out painted all over.
Extras. Ball bearings, 42s. Half-plated, 42s. All plated, 84s.
Remarks. A fair, ordinary machine at the price.

## DESIRABLE.

W. Lewis, Tempest Works, Wolverhampton.

Leading Features. Open front. Rear steering.
Description. Two 46 in . and one 18 in . wheel. Driving wheel 40 in ., running level. ${ }_{8}^{7} \mathrm{in}$. and ${ }_{8}^{5} \mathrm{in}$. rubbers. Crescent rims. 50 and 20, No. 11 direct spokes. G.M. hubs, bin. $x 4$ in. Ball bearings to driver and cones to steering wheel. Stanley rudder head. Rack and pinion steering. Spade handles. Double-cranked pedal shaft, plain, 5in. throw. Rubber pedals on plain bearings. Chain driving. Strap brake ( $4 \frac{1}{2} \mathrm{in} . \times \frac{3}{4} \mathrm{in}$.). Adjustable seat rod. Elliptical spring. Cushioned seat. Footrests on frame. Wrench. Oilcan. Spring top lubricators. Weight 82 lbs . Width 34 in ., reducing to 29 in . by taking off loose wheel. Hayfork frame, jointed in the middle.

$$
\text { Paije .. .. .. .. } £ 12 \text { 10s. } 0 \mathrm{~d} \text {. }
$$

Sent out painted all over in two colours.


THE DESIRABLE.
$\because$ Remarks. A fair strong machine for the money, of vary much the ordinary pattern. (See Advertisement.)

DIANA-D.D.

## St. George's-Foundry Co., Pope Stree Birmingham.



THE DIANA.
Leading Features. Front steering. Double driving with balance gear. Two speeds.

Description. Two 4 Sin. and one 20in. wheel. Driving wheels 48 in ., running as 48 in . and 34 in . ${ }^{7} \mathrm{in}$. and ${ }^{3} \mathrm{~B} \mathrm{in}$. rubbers. Crescent rims. 52 and 24 , No. 10 direct spokes. G.M. hubs, $5 \frac{1}{2} \mathrm{in}$. $x 4 \mathrm{in}$. Rapid ball bearings to all wheels and crank shaft. Sockst rudder head. Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shaft, 6 in. throw. Rubber pedals, coned. Chain driving, and Diana double driving gear. Push lever band (9in. x lin.) brake, with holder. Adjustable $\Gamma$ seat rod. Easy spring. Suspension saddle. Fostrests on frame, and petals also form footreits. Flat wrench. Oilcan Lubricators. Width 39 in . Weight 108lbs. Loop frame.

Specialties. Rapid ball bearings (page 33). Diana double driving gear (page 82). Diana two-speed gear (page 90 ).

$$
\text { Price .. .. .. .. } £ 21 \text { 0s. 0d. }
$$

Sent out with plated fittings, rest painted in two colours.
Remarlis. A well positioned, soundly constructed high-class double driver, with hill-climbing gear of a very simple and effective nature, and "all the latest improvements." (See Adrertisement.)

DOUBLE CHANGEABLE-D.D.
Hill \& Morton, Trafalgar Works, Upper Well Street, Coventry.


THE DOUBLE CHANGEABLE
Leading Features. Front steering. Independent double driving. Convertible into single or double machine.

Description. Two 46 in . and one 18 in . wheel. Driving wheels 46 in ., running level. $1 \frac{1}{4} \mathrm{in}$. and 1 in . rubbers. Crescent rims. 60 and 24, No. 11 direct spokes. G.M. hubs. Coned bearings to steering wheel, plain to drivers and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade handles. Double cranked pedal shafts. Rubber pedals, plain. Chain driving. Push lever double band brake. Adjustable $\Gamma$ seat rods. Elliptical springs. Pan seat and suspension saddle. Footrests on frame. Flat wrench. Oilcan. Width 60 in. , reducible to 38 in . by taking off one half. Weight 150 lbs . The frame is of the double loop variety, of tubular steel, divided in the centre, the two halves fitting together with a joint and socket top and bottom, with cross pins, by taking out which the machine may be parted.

Specialties. Divisional frame.
Price .. .. .. .. £23 0s. 0d. Sent out painted in two colours.
Extras. Balls to all wheels, 5 5̌s.
Remarks. This is a new introduction, and has only just been completed. It appears to be strongly built-though of course will have to stand the test of time. (See Advertisement.)

## DREADNOUGHT No. 1-D.D.

Manchester Tricycle Co., 14, Exchange Arcade, Deansgate, Manchester.
Leading Features. Front steering. Double driving with balance gear. Hand and foot power.

Description. Two 48 in . and one 20 in . wheel. Driving wheels 48 in ., running level. $\frac{7}{5} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 and 20, No. 11 direct spokes. G.M. hubs. Bail bearings to all wheels, and plain to crank shaft. Stanley rudder head. Rack and pinion steering. Spade handles. Double-cranked pedal shaft. Rubber pedals, plain. Chain driving, and Hillman's patent double driving gear. Push lever baud brake. Adjustable 「 seat rod. Elliptical spring. Tricycle saddle. Footrests on frame. Flat wrench. Oilcan. Bell. Width 35in. Weight 1001 bs. Loop frame.

Specialties. Hand levers in connection with the pedals.

$$
\text { Price .. .. .. .. } 221 \text { 0s. 0d. }
$$

Sent out with plated hubs, spokes, and handle fittings, rest painted in t.so colours.

Remarls. The action of this machine is the same as for an ordinary machine for the feet, but the arms are worked somewhat like pumping with a handpump, pulling against the pedals, and so utilising all the power of the rider for propulsion. It is a most useful machine for one who can use his feet but is not very strong on them. (See Advertisement.)

## DREADNOUGHT No. 2--D.D.

Manchester Tricycle Co., 14, Exchange Arcade, Deansgate, Manchester.
Leading Features. Front steoring. Double driving with balance gear. Auxiliary hand power.

Description. Two 48 in . and one 20 in . wheel. Driving wheels 48 in ., running level. ${ }_{8} \mathrm{in}$. and $\frac{3}{4}$ in. rubbers. Crescent rims. 60 and 20 , No. 11 direct spokes. G.M. hubs. Ball bearings to all wheels, and plain to crank shaft. Stanley rudder bead. Rack and pinion steering. Spade handles. Double-cranked pedal shaft. Rubber pedals, plain. Chain driving, and Hillman's patent double driving gear. Push lever band brake. Adjustable seat rod. Elliptical spring. Tricycle saddle, with back. Footrests on frame. Flat wrench. Oilcan. Bell. Width 35in. Weight 100 lbs . Loop frame of steel tube.

Specialties. Hand apparatus, with stop gear.
Price .. .. .. .. £21 0s. 0d.

## Sent out with plated hubs, spokes and handle fittings, rest painted in two colours.

Remarks. The leading feature of this machine is the addition of the hand apparatus as an auxiliary power for hill work or against the wind. A turn of the hand puts the gear into use, or it may be kept inert, when the machine acts just like an ordinary foot machine. (See Advertisement.)

## DUAL CONVERTIBLE-D.D.

## Centaur Crcle Co., West Orchard, Coventry.

Leading Features. Front steering. Convertible for use as a single or double. Double driving with kalance-gear in both forms. Tro tracks as a single machine.

Description. Two 48 in . and one 20 in . wheel. Driving wheels, 48 in . running as 42 in . $\frac{15}{1} \mathrm{i} \mathrm{in}$. rubbers. Crescent rims. 56 and 24, No. 11 direct butt-ended spokes. Iron hubs, 6in. x 4 in . Ball bearings to all wheels, and plain to crank shaft. Socket rudder head. Quadrant rack and pinion steering. Adjustable spade handles. Double-cranked pedal shaitts, 6 in. throw. Rubber pedals, plain. Chain driving and Townsend's patent double driving gear. Adjustable push lever band (7in. x lin.) brake. Adjustable $\Gamma$ seat rod. Elliptical spring. Pan seat and Long-distance saddle. Footrests on frame. Flat wrenches. Oilcan. Width $57 \mathrm{in} .$, reducible to 40 in . by separation of frame. Weight 1401 bs ., 9 ălbs. in single form. The frame is of the double loop variety, the sides being very gracefully bent so as to make the action perfectly vertical, and to do without a tilt-rod behind. $1 \frac{1}{4} \mathrm{in}$. steel tube is used.

Specialtios. Lines of frame. Convertibility. Townsend's patent driving gear, very similar to Pritchard's. Centaur adjustable brake handle (page 99).


THE DUAL CONVERTIBLE.

$$
\text { Price .. .. .. .. } £ 32 \text { 0s. 0d. }
$$

Sent out with plated fittings, rest painted in two colours.
Extras. Plated hubs and spokes, 25s.; Ball pedals, 40s. ; Cradle spring, 7 s .6 d . ; stand for use in converting, 7 s .6 d .

Remarks. "This was the first convertible tricycle ever made, and has now perfectly vertical frame, double driving in both forms, the same wheels used in each, and many other minor improvements added since its introduction. It is well and soundly made, and the joints connecting the two halves are especially arranged for strength. To take it apart, cross pins have to be taken out of the frame, axle and cranks, and the machine drawn apart, the off wheel then being taken off and put on the projecting axle, which in the double form runs inside the other half. (See Advertisement.)

## DUAL.

## Zephyr Tricycle Co., Lower Ford Street, Coventry.

Leading Features. Open front. Rear steering. Two speeds for hill work and the level, and feet may be kept stationary.


Description. Two 48 in . and one 18 in wheel. Driving wheels 42 in ., one running as 50 in ., the other as 34 in . ${ }_{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 40 and 20 , No. 11 direct spokes. G.M. hubs, 6 in. x. 4in. Ball bearings to drivers, and balls to steering wheel. Stanley rudder head. Rack and pinion steering. Spade handles. Double cranked pedal shaft. running in ball bearings. Rubber pedals, plain. Intermediate wheel driving (Jean's patent). Rob Roy ratchet double tyre brake. Adjustable seat rod. Arab Cradle spring. Pan seat. Footrests on frame. Wrench. Oilcan. Spring top lubricators. Weight 90lbs. Width 39in. Hayfork frame.

Specialties. Jean's patent dual hill gear (page 87). Rob Roy ratchet brake ( page 99).
Price .. .. .. .. £18 18s. 0d.

Sent out half bright, and rest painted in two colours.
Extras. Bright parts plated, £3. All plated, £6.. Adjustable handles, 15s.

Remarks. This is a well made strong machine, combining speed on the level with power at hills, the arrangement being fully effective, one side whesl dri ring for power, the other for speed. It runs well, and is a good, useful article. (Sce Adcertisement.)

## DUBLIN-C.D.

Carey Bros., 1, St. Audrew Street, Dublin.

the dublin (with hand levers).
Leading Features. Open front. Central driving. Double front steering. Lever action.

Description. Two 24 in . and one 40 in . wheel. Driving wheel 40 in ., rùnning level. lin. and ${ }_{8}^{7}$ in. rubbers. Crescent rims. 40 and 26 , No. 10 lock-nutted spokes. Iron hubs, oin. x 4in. Ball bearings to all wheels. Socket rudder head. Dublin steering. Spherical horn handles. Bicycle cranks and Dublin levers. Rubber and wood pedals on coned bearings. Spoon brake. Two spiral springs. Cushioned seat. Wrench. Oilcan. Spring top lubricators. Weight 871 lbs . Width 36 in . The frame is of tubing, two light tubes running back to the driving wheel bearings-one on each side. The ends of these are securely brazed to a stouter tube set at right angles to them, which tube has a straight length of 21 in ., when it bends sharply round at right angles at each end, finishing up with the sockets of the rudder wheels. These rudder wheels go first, and are connected by Blood's patent. The pedal levers work on a fulcrum upheld by two rods running down from the main frame.

Specialties. Dublin levers (page 6ŏ). Blood's patent steering gear (page 63).
Price .. .. .. .. £18 0s. 0d.

Sent out half plated, and painted in two colours.
Extras. Hand levers, £7. Apron for ladies, 10s. Mud-guard, 7s. 6d.
Remarks. The power is applied more from the loins than in any other tricycle, the hands doing little more than guiding. The position is upright, leaning rather back than forward. The steering is sensitive, yet steady, and the machine very compact and neat. The smallest circle it will make is from 1 fft. to 18 ft . diameter. It will go up stiff hills, though slowly, and at expense of some amount of muscular exertion. Great power may be exerted by straightening the leg against the levers, and an efficient brake is thus formed. It stands rough ground well, and does not sway, owing to the small size of the driving wheel. The speed is from 4 to 7 miles per hour, and the machine is very suitable for slow progression along marine promenades, \&c., by invalids and others not desiring a high speed. It is one of the oldest practical tricycles made, and is now chiefly built for invalids' use.

DUO-D.D.<br>W. Lewis, Tempest Works, Cleveland Road, Wolverhampton.



THE DUO.
Leading Features. For two rid-rs, one riding ie la bicycle and steering with the front wheel, the other using lever action.

Description. Two 50 in . and one 46 in . wheel. Driving wheels 46 in . and $50 \mathrm{in} .$, running level. ${ }_{8}^{7} \mathrm{in}$. rubbers. Crescent rims. 60, No. 10 direct spokes. G.M. hubs, 6 in. $x$ in. Roller bearings to all wheels. Stanley rudder head. Bicycle steering. Horn handles. Hollow forks. Double-cranked axle levers and bicycle cranks. Rubber pedals, on plain bearings. D.L.S. brake. Bolted sliding spriug to front, and C springs to back. Saddle and cushioned seat. Wrenchi. Oilcan. Spring top lubricators. Weight 124 lbs . Width 40 in . The frame to front wheel is that of a bicycle, the backbone just below the spring being brazed to a wide tubular loop running to each eud of the cross axle of the rear wheels. Levers work on fulcra beneath the seat.

Specialties. Frame and action.
Price $\quad$.. $\quad . \quad . \quad . \quad . \quad £ 17 \quad 5 \mathrm{~s} . \quad 0 \mathrm{~d}$.
Sent out painted in t vo colours.
Extras. Ball beari igs, 20 s.

Remarks. The earliest machine of a tandem nature. (See Advertisement.)

## DUPLEX EXCELSIOR--D.D.

Bayliss, Thomas, and Co., Excelsior Works, Lower Ford Street, Coventry.
Leading Features. Open front. Rear steer1\&3. For two riders sitting tandem fashion. Independent double driving. Intermediate wheel gear.

Description. Two 40 in . and one 20in. wheel. Driving wheels 40 in ., running as 46 in . ${ }_{8}^{7} \mathrm{in}$. and ${ }_{4}^{3 i n}$. rubbers. Crescent rims. 60 and 24 , No. 11 direct buttended spokes. Bell metal hubs, $5 \frac{1}{4} \mathrm{in} . \times 37 \mathrm{in}$. Ball bearings to all wheels and crank shafts. Stanley rudder head. Rack and pinion steering. Adjustable spade handles. Double cranked pedal shafts, 6in. throw. Rubber pedals, plain. Intermediate wheel driving. Püsh lever double band (6in. $\mathrm{x}_{8}^{7} \mathrm{in}$.) brake. Adjustable $\Gamma$ seat rod. Adjustable pitch elliptical springs. Long-distance saddles. Footrests on frame. Flat wrench. Oilcan. Width 36in. Weight 120 lbs . The frame is of weldless steel tube, and resembles a very long hayfork, having the sides bent in double curves so as to carry two crank shafts and two seats.

Specialties. Tandem arrangement. Excelsior wheel gear (page 70). Excelsior adjustable pitch spring (page 90).


Sent out with plated handle fittings, rest painted in two colours.
Extras. Suspeusion seats, 5 s .
Remarks. Strongly and soundly built. This was the first successful tandem style machine, and as a double machine is the lightest in the market. It has an advantage in having less windage, and also in being stowed into almost as small a space as a single machine. Has been much improved of late. (Sce Advertisement).

## DUTTON-D.D.

Lubricative Packing Co., 2, Hackney Road, London.
Leading Features. Open front. Rear steering. Powerful hand and foot lerer action. Ratchet double driving action. No dead point.

Description. Two 50in. and one 24in. wheel. Driving wheels $50 \mathrm{in} .{ }_{8}^{7} \mathrm{in}$. rubbers. Crescent rims. 72 and 36 , No. 12 direct spokes. G.M. hubs, 6 in. x 6 in. Ball bearings to all wheels. Stanley rudder head. Rack and pinion steering. Spade handle. Pear-shaped purchase handle. Rubber pedals on plain bearings. Dutton lever, and hand lever ratchet double driving gear. Double tyre brake. Adjustable seat rod. Elliptical spring. Cushioned seat. Wrench. Oilcan. Weight 112lbs. Width 37in. The frame is a tubular hayfork, with the front carried more out into the loop form, the driving. shaft crossing in front.

Specialties. Frame. Dutton driving gear.
Price .. .. .. .. £26 5s. 0d.

Sent out painted in three colours, with bright working parts.

> Extras. Plating, £4.

Remarls. This is a very powerful action, and is accomplished by two pedal levers or two manual levers, or by both together. The levers are connected with ratchets, which turn the driving shaft, and this imparts power to the driving wheels through gear wheels. The driving shaft is parted centrally, and. each lever drives a wheel.

## ECLECTIC-D.D.

South London Machinists' Co., Southwark, London.


THE ECLECTIC.
Leading Features. Open front. Rear steering. Double driving with ratchet gear. No chains or cog wheels.

Description. Two 48 in . and one 20 in . wheel. Driving wheels 48 in ., running level. lin. and ${ }_{8}^{7} \mathrm{in}$. rubbers. Crescent rims. 48 No. 10 , and 20 No. 11 direct spokes. G.M. hubs. Bail bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 6 in. throw. Rubber pedals, plain. Double Eclectic drıving, and ratchet double driving:
gear. Pull-up lever band (6in. $x$ lin.) brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Valise. Two lamps. Width 38 in., reducible to 28 in . by taking off both wheels. Weight $831 b s$. Hayfork frame.

Specialties. Eclectic driving gear (page 74).

$$
\text { Price .. .. .. .. £20 } 15 \mathrm{~s} . \quad 0 \mathrm{~d} .
$$

Sent out with bright spokes and handle fittings, rest painted in two colours. Extras. Half plated, £4; all plated, £7.
Remarks. The driving action is peculiar, and the machine appears to be decently put together and likely to take well in some quarters. It was first introduced at the Stanley Show as the Challenger, but the name has since been altered.

## EMPEROR

## Henry Patrick and Co., 47 and 48, Darlington Street, Wolverhampton.

Leading Features. Open front. Rear steering. Single driving.
Description. Two 44 in . and one 17 in . wheel. Driving wheel 44 in ., running level. ${ }_{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 50 and 20, No. 11 direct spokes. G.M. hubs, $5 \frac{1}{1} \mathrm{in} . \mathrm{x}$ 4in. Ball bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade steering handle, and pear shaped purchase handle. Double cranked pedal shaft, 7 in . throw. Rubber pedals on ball bearings. Chain driving. Push lever double tyre brake. Adjustable seat rod. Elliptical spring. Excelsior web-seated saddle. Footrests on frame. Pedals form footrests. Adjustable wrench. Oilcan. Lamp. Valise. Width 3tin., reducible to 26 in . by taking off the loose wheel. Weight 84 lbs . Hayfork frame.

$$
\begin{aligned}
& \text { Price .. .. .. .. £21 0s. 0d. } \\
& \text { Sent out all plated except part of frame under seat. }
\end{aligned}
$$

Remarks. An open fronted single driver, got up in good style.

## EMPRESS.

Thos. Smith \& Sons, Saltley Mills, Adderley Park Road, Birmingham.
Leading Features. Open front. Rear steering.
Description. Two 40 in . and one 18 in . wheel. Driving wheel 40 in ., running as $48 \mathrm{in} .{ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 48 and 22 , No. 11 direct spokes. Iron hubs, $5 \mathrm{in} . \times 3{ }_{8}^{5} \mathrm{in}$. Ball bearings to all wheels. Stanley rudder head. Rack and pinion steering. Spade handle. Pear-shaped purchase handle. Double-cranked pedal shaft, running in ball bearings. Rubber pedals on ball bearings. Chain driving. Double tyre brake. Adjustable seat rod. Elliptical spring. Cushioned seat. Footrests on frame. Wrench. Oilcan. Valve lubricators. Weight 85lbs. Width 39in. Hayfork frame.
Price .. .. .. .. .. £16 16s. 0d.

Sent out with hubs and spokes plated, rest japanned in good style.
Remarks. This machine has the pedals well down below the rider, and is got up in very taking style. It is a strong, substantial machine, and can be made double driving to order by using two chains and ratchets, or it can be had with plain bearings at two guineas less.

## ENGLEFIELD—D.D.

## J. Blenheim \& Son, New Egham, Surrey.

Leading Features. Front steering. Open front. Double driving with steel bánds and clutch gear. Variation of power.
Description. Two 48 in . and one 20 in . wheel. Driving wheels 48 in ., running from 30 in . to 52 in . ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{5} \mathrm{in}$. rubbers. Crescent rims. 48 and 20, No. 11
direct spokes. G.M. hubs. Ball bearings to steering wheel, rollers to driving shaft, and plain to cranks. Stanley rudder head. Rack and pinion steering. Adjustable spade handles. Rubber pedals, plain. Central steel band driving and ball clutch double driving gear. Push lever double band (5in. x lin.) brake. Adjustable $\Gamma$ seat rod. Arab Cradle spring. Long distance saddle. Pedals form footrests. Adjustable wrench. Oilcan. Lamp. Width 38.2 i in. Weight 95 lbs . The frame is of steel tube.

Specialties. Construction of frame. Variation of power. Ball clutch for driving (addenda). Bands for driving.

Price .. .. .. .. £20 0s. 0d.

## Sent out painted in two colours.

Remarks. I have not seen this machine yet as it has only just been placed on the market, but it appears to have many good points, the variation of power amongst others, which I am told is effected at the will of the rider whilst in motion, the gearing being to any power between 52 in . and 30 in ., and whilst there are no dead points, any length of stroke can be taken; the pedals are still when going down hill, aud the feet can be brought to any position for starting.

## ESSENTIAL-D.D.

## W. Gwinnett \& Co., Wednesfield Road, Wolverhampton.

Leading Features. Open front. Rear steering. Double driving with uwo chains.

Description. Two 50 in . and one 20 in . wheel. Driving wheels $50 \mathrm{in} .$, running level. ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 50 and 20, No. 11 direct spokes. G.M. hubs. Coned bearings to steering wheel, plain to drivers and crank shaft. Stanley rudder head. Rack and pinion steering. Spade handles. Doublecranked pedal shaft, $5 \frac{1}{2} \mathrm{i}$. throw. Rubber pedals, plain bearings. Central chain driving. Pull-up lever double tyre brake. Adjustable seat rod. S spring. Saddle. Pedals form footrests. Flat wrench. Oilcan. Bell. Width 36 in . Weight 87 lbs . Hayfork frame.
Price .. .. .. .. £16 0s. 0d.

Sent out with plated fittings, rest painted in two solours.

$$
\text { Extras. Lamps, } 10 \text { s. }
$$

Remarks. A fair ordinary machine.

## EUREKA.

South London Machinists' Co., Suffolk Grove, Southwark, London.
Leading 'eatures. Open front. Rear steering. Single driving.
Description. Two 50 in . and one 20 in . wheel. Driving wheel $50 \mathrm{in} .$, running level. lin. and $\frac{7}{8}$ in. rubbers. Crescent rims. 50 No. 10 , and 20 No. 11 direct spokes. G.M. hubs, $7 \mathrm{in} . \times 4 \mathrm{in}$. Plain bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shaft, 6in. throw. Rubber pedals, plain. Chain driving. Pull-up lever double tyre brake. Elliptical spring. Pan seat. Footrests on frame. Flat adjustable wrench. Oilcan. Width 36 in ., reducible to 29 in . by taking off the loose wheel. Weight 871 lbs . Iron hayfork frame.
Price .. . .. .. ... £12 15s. 0d.

Sent out with bright spokes and handle fittings, rest painted in two colours.
Remarks. An ordinary machine. (See Advertisement.)

## EUROPA-D.D.

St. George's Foundry Co., Pope Street, Birmingham.
$L^{\circ}$ ading Features. Front steering. Double driving with balance gear. Two speeds. Convertible to either single or double.

Description. Two 48 in . and one 20 in . wheel. Driving wheels 48 in ., running as 48 in . and 34 in . $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 52 and 24 , No. 10 direct spokes. G.M. hubs, $5 \frac{1}{2} \mathrm{in} . \mathrm{x} 4 \mathrm{in}$. Rapid ball bearings to all wheels and crank shafts. Socket rudder head. Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shafts, 6 in. throw. Rubber pedals, coned. Chain driving, and Diana double driving gear. Push lever band (9in. x lin.) brake, with holder. Adjustable $\Gamma$ seat rod. Easy spring. Pan seat and Long-distance saddle. Footrests on frame, and pedals also form footrests. Flat wrench. Oilcan. Lubricators. Width 56in., reducible to 35 in. by taking off one half. Weight 145lbs. The frame is of the double loop variety, so made as to be easily divided.

Specialties. Rapid ball bearings (page 33). Diana double driving gear (page 82). Easy spring (page 51). Diana two-speed gear (page 90).

$$
\text { Price } \quad . . \quad . . \quad . \quad . . \quad £ 26 \quad 0 \mathrm{~s} . \quad 0 \mathrm{~d} .
$$

Sent out with plated fittings, rest painted in two colours.
Remarks. A strongly built sociable convertible. It has been completely altered since its first introduction at the Stanley show, and as it is only just complete in its new form I cannot say more of it at present. (See Advertisement.)

EXCELSIOR No. 1.
Bayliss, Thosis \& Co., Excelsior Works, Lower Ford Street, Coventry.

the excelsior no. 1.
Leading Features. Open front. Rear steering. Single driving. Unequal wheels. Intermediate wheel gear.

Description. Wheels 50 in ., 30in. and 20in. Driving wheel 50 in ., running level. $\frac{7}{8} \mathrm{in}$. and $\frac{13}{6} \mathrm{in}$. rubbers. Crescent rims. 60 and 24 , No. 11 direct buttended spokes. G.M. hubs, $6 \frac{1}{2} \mathrm{in} . \times 3 \frac{3}{4} \mathrm{in}$. Ball bearings to all wheels and crank
shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 6in. throw. Rubber pedals, plain. Excelsior wheel gearing. Push lever tyre brake. Adjustable $\Gamma$ seat rod. Adjustable elliptical spring. Pan seat. Footrests nn frame. Flat wrench. Oilcan. Width $36 i n .$, reducible to 32in. by taking off the loose wheel. Weight $801 b s$. Hayfork frame of weldless steel tube.
-Specialties. Excelsior wheel gearing (page 70). Excelsior spring adjustment (page 53). Excelsior adjustable handles (page 59).
Price .. .. .. .. £17 17s. 0d.

Sent out with plated handle fittings, rest painted in two colours.
Remarks. This was one of the earliest successful tricycles, and formed a model on which many were built. It was the first machine built lightly for rasing purposes, and scored mqny successes in the earlier days of tricycle racing. It was on one of these Mr. John Hawkins, junr., rode 190 miles in the day last season. (See Advertrsement.)

## EXCELSIOR PET.

Bayliss, Thowas, \& Co., Excelsior Works, Lower Forł Street, Coventry.


THE EXCELSIOR PET.
Leading Features. Open front. Rear steering. Single driving. Intemediater wheel sgear.

Description. Two 40 in . and one 20in. wheel. Driving wheel 40 in ., running level. $\frac{1}{13}$ in. rubbers. Crescent rims. 60 and 24, No. 11 direct butt ended spokes. G.M hubs, $5 \frac{1}{2} \mathrm{in}$. x $3 \frac{1}{2} \mathrm{in}$. Ball bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steэring. Adjustable spade handles. Double cranked pedal shaft, 6 in. throw. Rubber ped tls, plain. Excelsior wheel gear. Push lever double tyre brake. Adjustable $\Gamma$ seat rod. Adjustable elliptical spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Width 36 in ., reducible to $32 \frac{1}{2} \mathrm{in}$. by taking off the loose wheel. Weight 801 bs . Hayfork frame of weldless steel tube.

Specialties. Excelsior wheel gear (page 70). Excelsior adjustable handles page 59). Excelsior adjustable pitch spring (page 33. )

Price .. .. .. .. £17 17s. 0d.
Sent out painted in two colours.
Extras. Bright parts plated, 40s. 44in. wheels, 20s.
Remarks. A well built, reliable and trustworthy machine, like the last, but with equal in place of unequal side wheels. (See Advertisement.)

EXPRESS.
J. Devey \& C̣o., Tower Works, Wolverhampton.


THE EXPRESS.
Leading Features. Open front. Rear steering. Single driving.
Description. Two 44in. and one 20in. wheel. Driving wheel 44in., running as $50 \mathrm{in} .{ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 48 and 20, No. 10 direct spokes. G.M. hubs, 6 in. x 4 in . Ball bearings to all wheels, plain to crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 6 in. throw. Rubber pedals, plain. Chain driving. Pull-up lever double tyre brake. Adjustable seat rod. Eliiptical spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Two lamps. Valise. Width $36 \mathrm{in} .$, reducible to 32in. by taking off the loose wheel. Weight 85lbs. Hayfork frame.

$$
\text { Price .. .. } \quad . \quad . \quad . \quad \text {.. } 14 \text { 0s. } 0 \text {. }
$$

Sent out with plated spokes and handle fittings, rest painted in two colours.
Remarks. A well-built machine of the ordinary type, at a reasonable figure-

## EXPRESS SPECIAL.

## J. Devey and Co., Tower Works, Wolverhampton.

Leading Features. Front steering. Bicycle action. Central gear. Single driving.

Description. Two 44in. and one 20in. wheel. Driving wheel 44in., running as $50 \mathrm{in} .{ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 48 and 20 , No. 10 direct spokes. G.M. hubs, 6in. x 4in. Ball bearings to all wheels. Stanley rudder head. Bath chair steering. Bicycle handles. Bicycle cranks. Rubber pedals, coned. Central chain driving. Grasp lever front wheel spoon brake. Adjustable seat rod. Elliptical spring. Suspension saddle. Footrests on
frame. Adjustable wrench. Oilcan. Lamp. Bell. Width 36in. Weight 80lbs. The frame is of the $T$ pattern, carrying the steering wheel in front and running straight back to the cross tube over the axle. The pedals and lower chain wheel are carried in a fork hung from the main tube.

Specialties. Frame and method of steering.
Price .. .. .. .. £12 0s. 0d.

Sent out with plated fittings, rest painted in two colours.
Remarks. This has only just been introduced. It steers with bicycle handles on the Bath chair principle, the rider is well over his work and has the gear central. It is mounted and dismounted from behind.

## FAVOURITE ROTARY.

(See Manumotive Machines.)
FLEET-D.D.
Settle \& Co., Fleet Works, Coventry.


> THE "FLEET"
> DOUBLE DRIVER

Leading Features. Front steering. Double driving with balance gear.
Description. Two 50in. and one 18in. wheel. Driving wheels 50in., running as 46 in . ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 56 and 20, No. 11 direct spokes. Ball bearings to all wheels, plain to crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shaft. Settle's patent twin-rubber pedals, plain. Chain driving, and Settle's patent double driving gear. Push lever band (6in. x lin.) brake. Adjustable T seat rod. Special spring. Pan seat. Footrests on frame. Two flat wrenches. Oilcan. Width 39in. Weight 85lbs. Loop frame of weldless steel tube, with side tilt rods.

Specialties. Settle's pedals (page 26). Settle's balance gear (page 82). Special spring (page 49).
Price .. .. .. .. £21 0s. 0d.

Sent out with plated fittings, rest painted in two colours. Extras. Cradle spring, 10s.
Remarks. A beautifully constructed machine throughout of the most approved pattern. Vertical action, adjustable handles, balance gear, \&c., \&c. It is highly finished, fast, comfortable and reliable in every respect. (See Advertisement.)

## FLORENTINE.

Thos. Hovgr, Mander Street, Penn Road, Wolverhampton.
Leading Features. Open front. Rear steering. Single driving.

Description. Two 44in. and one 18in. wheel. Driving wheel 44in., running level. $7_{8} \mathrm{in}$. and $\frac{3}{4}$ in. rubbers. Crescent rims. 50 and 20 , No. 11 direct spokes. G.M. hubs. Hough's ball bearings to steering wheel, plain to drivers, and ball to crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 6 in. throw. Rubber pedals, plain. Chain driving. Pull-up lever double tyre brake. Adjustable seat rod. Elliptical spring. Cushioned seat. Adjustable wrench. Oilcan. Bell. Width 40in., reducible to 33in. by taking off the loose wheel. Weight 871 lbs . Hayfork frame.

Specialties. Hough's ball bearings.

$$
\begin{array}{llllll}
P_{\text {RICE }} & . & . . & . & \ldots & £ 12 \\
\text { 10s. } & 0 d .
\end{array}
$$

Sent out painted in two colours.
Extras. Ball bearings to large wheels, 20s.
Remarks. A fair article at the price.

FLYING DUTCHMAN.<br>Hillman, Herbert \& Cooper, Premier Works, Coventry.



THE FLYING DUTCHMAN.
Leading Features. Open front. Rear steering. Single driving.
Description. Two 42 in . and one 18 in . wheel. Driving wheel 42 in ., running level. ${ }_{8} \mathrm{in}$. and $\frac{3}{4}$ in. rubbers. Crescent rims. 60 and 20 , No. 12 direct spokes. G.M. hubs. Coned bearings to steering wheel, plain to driver and crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, $5 \frac{3}{4} \mathrm{in}$. throw. Rabber pedals, plain. Chain driving. Pull-up lever band double tyre brake, with holder. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Width 37in., reducible to 32in. by taking off the loose wheel. Weight 83 lbs . Hayfork frame.

Specialties. Fillman's brake holder (page 99). Harrington's enamel (page 123).
Price .. .. .. .. £16 16s. 0d.

Sent out enamelled all over in Harrington's enamel.
Remarks. A soundly constructed reliable machine, of the ordinary type. It was on one of these machines the first 50 miles tricycle championship road ride was won. (See Advertisement.)

## FLYING DUTCHMAN.

Simedley \& Green, Arkwright Street, Nottingham.
Leading Features. Open front. Rear steering. Single द̈riving.
Description. Two 44in. and one 18in. wheel. Driving wheel 44in., running level. ${ }_{8} \mathrm{in}$ in. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 48 and 20 , No. 11 direct spokes. G.M. hubs, 5 in . x 4 in . Ball bearings to all wheels, plain to crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pearshaped purchase handle. Double cranked pedal shaft, 6in. throw. Rubber pedals, plain. Chain driving. Grip lever double tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Flat wrench. Oilcan. Cyclists' wallet. Lamps. Width 36in., reducible to 31in. by taking off the loose wheel. Weight 80lbs. Hayfork frame.
Price .. .. .. .. £17 17s. 0d.

Sent out with plated spokes and handle fittings, rest painted in two colours.
Extras. Balls to crank shaft, 30s. Ball pedals, 42s.
Remarks. A well constructed, vertically positioned machine, of the usual single driving type.

## FLYING EAGLE TRICYCLE No. 1-D.D.

The Midland Machinists' Co., 88, Great Charles Street, Snow Hill, Birmingham.
Leading Features. Open front. Rear steering. Double driving, with two sets of gear wheels. Reversing clutch.

Description. Two 48in. and one 20in. wheel. Driving wheels 48 in ., running level. $7^{7} \mathrm{in}$. and ${ }_{4} \mathrm{in}$. rubbers. Crescent rims. 52 and 20, No. 12 direct spokes. Bown's G.M. hubs, 7in. x 4in. Æolus ball bearings to drivers, and شolus balls to steering wheel. Stanley rudder head. Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shaft, running in ball bearings. Rubber pedals, plain. Double intermediate wheel driving, and a ratchet type of double driving gear. Double tyre brake. Adjustable seat rod. Arab Cradle spring. Pan seat. Wrench. Oilcan. Spring top lubricators. Weight $801 b s$. Width 36in., reducing to $23 i n$. by taking off driving wheels. Hayfork frame.
Price .. .. .. .. £20 0s. 0d.

Remarks. A strongly built machine.

## FLYING EAGLE No. 2.

## Midland Machinists' Co., 88, Great Charles Street, Birmingham.

## Leading Features. Open front. Rear steering.

Description. Two 48in. and one 18in. wheel. Driving wheel 48 in ., running level. ${ }_{8} \mathrm{in}$. and ${ }^{3} \mathrm{in}$. rubbers. Crescent rims. 48 and 20 direct spokes. G.M. hubs. Plain bearings throughout. Stanley rudder head. Rack and pinion steering. Spade handle. Pear-shaped purchase handle. Doublecranked pedal shaft. Rubber pedals. Chain driving. Double tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Wrench. Oilcan. Weight 80lbs. Width 42 in ., reducing to 30 in . by taking off loose wheel. Hayfork frame.

$$
\text { PRICE .. .. . .. .. } \begin{array}{lllll} 
& 15 & 15 & 0 d .
\end{array}
$$

Sent out painted all over in two colours.
Extras. Half plated, 40s. All plated, £3 10s.
Remarks. An ordinary machine.

## FLYING EAGLE SOCIABLE-D.D.

Midland Machinists' Co., 88, Great Charles Street, Snow Hill, Birmingham. Leading Features. Front steering. Clear front to each rider. For two riders.

Description. Two 36 in . and one 20in. wheel. Driving wheels 36 in . running as 46 in . $1 \frac{1}{8} \mathrm{in}$. and $\frac{7}{8} \mathrm{in}$. rubbers. Crescent rims. 48 and 24, No. 9 direct spokes. G.M. hubs. Plain bearings throughout. Stanley rudder head. Rack and pinion steering. Spade handle. Pear-shaped purchase handles. Doublecranked pedal shaft. Rubber pedals. Double chain driving. Powerful lever double band brake. Adjustable seat rods. Elliptical springs. Pan seats. Footrests on frame. Wrench. Oilcan. Weight 140lbs.' Width 58in. The frame is a double hayfork reversed, i.e., a main tube running forwards from each bearing, and a long central tube running out to the front wheel.

$$
\begin{array}{cccccc}
\text { Price } & \text {.. .. .. } \\
& \text { Sent out painted all over. }
\end{array}
$$

Extras. Ball bearings, 30s.

## FLYING SCUD.

Henry Patrick \& Co., 47 and 48, Darlington St., Wolverhampton.
Leadiny Features. Open front. Rear steering. Single driving.
Description. Two 50in. and one 17in. wheel. Driving wheel 50in., running level. ${ }_{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 and 20 , No. 11 direct spokes. G.M. hubs, $5 \frac{1}{4} \mathrm{in} . \times 4 \mathrm{in}$. Double ball bearings to all wheels, and plain to crank shaft. Stanley rudder head. Rack and pinion steering. Spade' steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 7in. throw. Rubber pedals, plain. Chain driving. Pull-up lever tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Lamps. Valise. Width 34in., reducible to 26 in. by taking off the loose wheel. Weight 871 lbs . Hayfork frame.
Price .. .. .. .. £17 10s. 0d.

Sent out with plated hubs, spokes, and handle fittings, rest painted in two oolours.

Remarks. A good machine of the ordinary rear steering type.
FLYING SCUD-D.D.

South London Machinists' Co., Suffolk Grove, Southwark, London.

the flying scud.
Leading Features. Open Front. Rear steering. Double driving with two chains.

Description. Two 44 in . and one 18 in . wheel. Driving wheels 44 in ., running level. lin. and $\frac{3}{2}$ in. rubbers. Crescent rims. 50 No. 10, and 20 No. 11 direct spokes. G.M. hubs, $5 \frac{1}{2} \mathrm{in} . \mathrm{x} 4 \mathrm{in}$. Ball bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 6 in. throw. Rubber pedals, plain. Double chain driving, and ratchet double driving gear. Pull-up lever double tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Pedals form footrests. Adjustable wrench. Oilcan. Lamps. Valise. Width 36in., reducible to 25 in . by taking off both wheels. Weight 84lbs. Hayfork frame.
PRICE ..

Sent out with plated fittings, rest painted in two colours.
Extras. Half plated, £4; all plated, £6.
Remarks. Ten per cent. discount is allowed off the price of this machine. (See Advertisement.)

FLYING SCUD FRONT STEERER-D.D.
South London Machinists' Co., Southwark, London.


## Leading Features. Front steering. Double driving wit'l balancs gear.

Description. Two 50in. and one 20 in . wheel. Driving wheels 50 in ., running level. lin. and ${ }_{8} \mathrm{in}$. rubbers. Crescent rims. 50 No. 10 , and 20 No. 11 direct spokes. G.M. hubs, 7 in. x $4 \frac{1}{2}$ in. Plain bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 6 in. throw. Rubber pedals, plain. Intermediate ball wheel driving gear, and Starley's patent double driving gear. Pusb lever band (6in. x lin.) brake. Adjustable seat rod. Scroll spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Lamps. Valise. Width 38in. Weight 941 bs . Loop frame.

$$
\text { Price } . . \quad . \quad, \quad . \quad . \quad £ 17 \text { 15s. 0d. }
$$

Sent out with bright spokes and handle fittings, rest painted in two colours.
Extras. Half plated, £3. All plated, £7. Balls to front whe 3 , 20s.
Remarks. A neat front-steering double driver, built with fair verticality a nd of sound material. (See Advertisement.)

## FOLDING EXCELSIOR.

Bayliss, Thomas \& Co., Excelsior Works, Lower Ford Street, Coventry.


THE FOLDING EXCELSIOR.
Leading Features. Open front. Rear steering. Single driving. Intermediate wheel gear. Folding for stowage.

Description. Two 44in. and one 20in. wheel. Driving wheel 44in., running level. $\frac{13}{1} \frac{1}{6} \mathrm{in}$. rubbers. Crescent rims. 60 and 24, No. 11 direct butt-ended spokes. Bell-metal hubs, 6 in. $\times 3$ 3inin. Ball bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shaft, 6in. throw. Rubber pedals, plain. Excelsior wheel gear. Push lever double tyre brake. Adjustable 「 seat rod. Adjustable elliptical spring. Tricycle saddle. Footrests on frame. Flat wrench. Oilcan. Width 33in., reducible to 18 in . by Fletcher's patent method. Weight 84lbs. Hayfork style of frame.

Specialties. Excelsior wheel gear (page 70). Excelsior 'spring adjustment (page 53). Fletchers patent folding arrangement (page 46).
Price .. .. .. .. £21 0s. 0d.

Sent out with plated handle fittings, rest painted in two colours.
Remarks. This is a well-made machine, and the easiest and quickest folded tricycle in the market. By taking out a taper pin the whole can be drawn together and wheeled into any 18in. doorway, thus taking up less space than a bicycle. (See Advertisement.)

## FOUR-IN-HAND-D.D.

## Centaur Cycle Co., West Orchard Works, Coventry.

Leading Features. Front steering. Double driving with balance gear. For four riders.

Description. Two 48 in . and one 20in. wheel. Driving wheels 48 in ., running as 42 in . lin. and ${ }_{8}^{7} \mathrm{in}$. rubbers. Crescent rims. 50 and 24 , No. 8 direct spokes. Iron hubs, 6 in. $x 4 i n$. Ball bearings to all wheels, plain to crank shaft. Socket
rudder head. Quadrant rack and pinion steering. Spade steering handle, and pear-shaped purchase handles. Double cranked pedal shafts, 6 in. throw. Rubber pedals, plain. Chain driving, and Townsend's patent doubleld driving gear. Push lever double band (7in. x lin.) brake. Adjustable seat rods. Centaur springs and Cradle springs. Pan seats and Long-distance saddles. Footrests on frame. Flat adjustable wrench. Oilcan. Width 57in. Weight 2241bs. The frame is of the double loop variety for the fore part, tubes dependrearwards to carry the crank shafts of the rearmost riders, whilst short tubes project backwards from the frame to carry their seats.


Specialties. Frame. Centaur adjustable brake handle (page 99). Townsend's balance gear, very similar to Pritchard's. Arrangement for four riders.

$$
\begin{aligned}
& \text { Price } \quad . \quad . \quad . . \quad . \quad £ 45 \text { 0s. 0d. } \\
& \text { Sent out painted in two co!ours. }
\end{aligned}
$$

Remarks. The above illustration shows the machine as at first made, since when it has been much improved in making the frame more vertical, and in providing a specially strong balance gear, driven by two chains on the same drum, each actuated by a pair of riders. It is a fine thing for club use. The cranks can be set at $\frac{1}{4}$ section if wished by the riders themselves. Two ladies are supposed to sit in front and two gentlemen behind (See Advertisement.)

## GLADSTONE GEM.

Jaues Beech, Gladstone Works, Wolverhampton.
Leading Features. Open front. Rear steering. Single driving.
Description. Two 50 in . and one 20 in . wheel. Driving wheel 50 in ., running level. $\frac{7}{8}$ in. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 No. 10 , and 24 No. 11 direct spokes. G.M. hubs. Coned bearings to steering wheel, plain to driver and crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double cranked pedal shaft. Rubber pedals, plain. Chain driving. Pull-up lever double tyre brake. Adjustable seat rod. Scroll spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Bell. Width 37 in ., reducible to 32 in . by taking off the loose wheel. Weight 891 bs. Hayfork frame.

> Price $\ldots \quad . . \quad . \quad . \quad$ £11 10s. 0d.
> Sent out painted in two colours.
> Extras. Ball bearings to all wheels, 30 s.
> Remarks. A very low-priced machine of the ordinary cut.

## GLADSTONE LADY'S GEM.

## Jaires Beech, Gladstone Works, Wolverhampton.

Leading Features. Open front. Rear steering. Single driving.
Description. Two 40 in . and one 18 in . wheel. Driving wheel $40 \mathrm{in} .$, running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 50 No. 10, and 20 No. 11 direct spokes. G.M. hubs. Coned bearings to steering wheel, plain to driver and crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft. Rubber pedals, plain. Chain driving. Pull-up lever back wheel spoon brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Dress guard to chain. Flat wrench. Oilcan. Bell. Width 36 in ., reducible to 30 in . by taking off the loose wheel. Weight 80lbs. Hayfork frame.

$$
\text { Price } \underset{\text { Sent out painted in two colours. }}{\ldots} \quad \underset{\text { s. }}{\ldots} \text { 10s. }
$$

Extras. Ball bearings to wheels, 30s.
Remarks. Built small for ladies' use. An exceedingly low-priced article.
GNAT-C.D.

Metropolitan Machinists' Co., Bishopsgate Street Without, London, E.C.
Leading Features. Double front steering. Central driving. Divisable for stowage.

Description. Two 18 in . and one 28 in . wheel. Driving wheel 28in., running as 56 in. $\frac{3}{4}$ in. rubbers. Crescent rims. Direct spokes. G.M, hubs. Ball bearings to all wheels, plain to cranks. Stanley rudder head. Rack and pinion Gnat double steering. Adjustable spade handles. Bicycle cranks. Rubber pedals, plain. Central chain driving. Push lever spoon brake. Adjustable seat rod. Elliptical spring. Long-distance saddle. Adjustable wrench. Oilcan. Two lamps. Alarm. Valise. Width 36in., reducible to 20 in . by taking off the fore part of the machine. Weight 70lbs. The frame consists of a bent tube, running from the centre of the Gnat steering arrangement backwards up in front of the driving wheel, which is in the rear. To the top of this is fitted the seat rod, with curved arms, to carry the handles projecting on each side, the whole being stayed and supported by rods running to the bearings of the driving wheel.

Specialties. Frame. Gnat double steering (page 63).
Price .. .. .. .. £18 10s. 0d.

Sent out with bright spokes and handle fittings, rest painted in two colours.
Extras. Plated fittings, 30 s .; all bright parts plated, 70 s .; all plated £6 10s.

Remarks. This is a small machine, highly geared up, and has several good points, notably that of central driving and rotary action.

## GOLIGHTLY.

Albert Phillips, Excelsior Works, Pea Street South, Birmingham.
Leading Features. Open front. Rear steering. Single driving.
Description. Two 42in. and one 20in. wheel. Driving wheel 42 in ., running level. ${ }_{8} \mathrm{i}$ in. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 48 and 20 , No. 11 direct spokes. G.M. hubs $5 \frac{1}{2} \mathrm{in} . \mathrm{x} 4 \frac{1}{2} \mathrm{in}$. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, $5 \frac{1}{2}$ in. throw. Rubber pedals, plain. Chain driving. Pull-up lever double tyre brake. Adjustable seat rod. Elliptical cushioned seat. Footrests on frame. Flat wrenches. Oilcan. Valise. Width 3sin., reducible to 33in. by taking off the loose wheel. Weight 85lbs. Hayfork frame.
Price .. .. .. .. .. £13 0s. 0d.

Sent out with bright spokes and handle fittings, rest painted in two colours.
Remarks. A fair machine of the usual open-fronted type. No special features. (See Advertisement.)

## GREYHOUND No. 1-D.D.

Mercury Machinists' Co., 5, 6 and 7, Aston Road, Birmingham.
Leading Features. Front steering. Double driving with ratchet gear. Central gear. Bicycle action.


THE GREYHOUND NO. 1.
Description. Two 44in. and one 20in. wheel. Driving wheels 44 in ., running level. ${ }_{4}^{3}$ in. rubbers. Crescent rims. 54 and 20, No. 11 direct spokes. G.M. hubs. Ball bearings to all wheels, plain to cranks. Stanley rudder head. Greyhound steering. Bicycle handles. Detachable bicycle cranks, 6 in . to 7 in . throw. Rubber pedals, plain. Central chain driving, and Greyhound double driving gear. Double lever double band (6in. x ${ }_{8}^{7} \mathrm{in}$.) brake. Adjustable seat rod. C spring. Long-distance saddle. Pedals form footrests. Flat wrench. Oilcan. Valise. Width 37in. Weight 75lbs. The frame, which is of steel tube, is of $T$ pattern, with bicycle handles on a staud and in front of the rider, and central chain and cranks carried in a fork below him.

Specialties. Design of frame. Greyhound steering (page 60). Greyhound double driving gear (page 79).

Price .. .. .. .. £16 16s. 0d. Sent out with plated fittings, rest painted in two colours.
Extras. Ball pedals, 15s. Adjustable handles, 10s.
Remarks. This is a new introduction this year, and has taken wonderfully. The action is perfectly vertical, and the running easy. It is mounted and dismounted from behind, and is well and soundly made, and neatly finished.

## GREYHOUND No. 2--D.D.

Mercury Machinists' Co., 5, 6, \& 7, Aston Road, Birmingham.
Leading Features. Front steering. Double driving with ratchet gear. Central gear arranged for ladies' use.
Description. Two 44in. and one 20in. wheel. Driving wheels 44in., running level. $\frac{3}{4}$ in. rubbers. Crescent rims. 54 and 20, No. 11 direct spokes. G.M. hubs. Ball bearings to all wheels, plain to cranks. Stanley rudder head. Rack and pinion steering. Spade handles. Bicycle cranks, 4in. to 7in. throw. Rubber pedals, plain. Central chain driving, and Greyhound double-driving gear. Push lever double band (6in. $\times{ }_{8}^{7} \mathrm{in}$.) brake. Adjustable seat rod. C spring. Pan seat. Pedals form footrests. Flat wrench. Oilcan. Valise. Width 37in. Weight 72 lbs . The frame is of the $T$ variety, but the central tube in place of running straight from the axle to the steering head as in the last, makes a downward curve to the crank bearings, and then rises over the steering wheel. The handles are at the sides.

Specialties. Frame. Greyhound double driving gear (page 79).

$$
P_{\text {RICE }} \quad . . \quad . . \quad . . \quad . . \quad £ 16 \text { 16s. 0d. }
$$

Sent out with plated fittings, rest painted in two colours.
Extras. Ball pedals, 15s.; adjustable handles, 10s.
Remarks. This is really on the same lines and principle of construction as the last, but the plan of the frame and arrangement of the gearing admits of its use by both sexes. It is light, well finished, and well made.

## HAND-LEVER EXCELSIOR.

(See Manumotive Machines.)

## HAND-LEVER VOLANTE.

(See Manumotive Machines.)

## H.C. COVENTRY ZEPHYR—D.D.

## The Zephyr Bicycle and Tricycle Co., Lower Ford Street, Coventry.

Leading Features. Front steering. Double driving with balance gear. Two speeds for hill work.

Description. Two 46 in . and one 20 in . wheel. Driving wheels 46 in ., running level or as 33 in . ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 and 20 , No. 10 direct spokes. G.M. hubs, 6 in $\times 4$ in. Ball bearings to steering wheel, roller to driving shaft, and plain to crank shaft. Socket rudder head. Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shaft, 6in. throw. Rubber pedals, plain. Chain driving, and Starley's patent double driving gear. Zephyr hill-gear. Push lever band (6in. $x \frac{3}{4}$ in.) brake with holder. Adjustable T seat od. Arab Cradle spring. Lıong-distance saddle. Footrests on frame. Adustable wrench. Oilcan. Width 39in. Weight 99 lbs . The frame is of flat
steel built on the loop principle with safety rod behind, though I believe a tubular weldless steel frame will shortly be added.
Specialties. Roб Roy ratchet brake holder (page 99). Zephyr hill gear (page 91). Starley's balance gear (page 80).


THE H.C. COVENTRY ZEPHYR.
Price .. .. .. .. £24 10s. 0d.

Sent out with plated fittings, rest painted in two colours.
Extras. Roller pedals, 30s.

Remarks. This is a sound, well-built, and vertically positioned front steering double driver, with the addition of a very simple and effective two-speed gearing. (See Advertisement.)

## HERO.

T. Smallwood \& Co., Union Mills, Foleshill, Coventry.

Leading Features. Open front. Rear steering. Single driving.
Description. Two 40 in . and one 18in. wheel. Driving wheel 40 in ., running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 48 and 20 , No. 10 direct spokes. Iron hubs. Ball bearings to all wheels, plain to crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 6 in. throw. Rubber pedals, plain. Chain driving. Pull-up lever double tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Valise. Width 39in., reducible to 32in. by taking off the loose wheel. Weight 84lbs. Hayfork frame.

$$
\begin{aligned}
& \text { Price } \quad \text {.. .. .. .. } \quad \text { £ } 16 \text { 0s. 0d. } \\
& \text { Sent out painted in two colours. }
\end{aligned}
$$

Extras. Two-chain double driving, 40 s .
Remarks. A soundly constructed machine of the usual open fronted type, with no especial features.

T. Smallitcod \& Co., Union Mills, Foleshill, Coventry.


THE HERO SPECIAL.
Leading Features. Open front. Rear steering. Single driving.
Lescription. Two 44in. and one 20in. wheel. Driving wheel 44in., running lerel. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{8} \mathrm{in}$. rubbers. Crescent rims. 50 and 20, No. 11 direct spokes. G.M. hubs, 6 in. $\times 4 \mathrm{in}$. Ball bearings to all wheels, plain to crank ishaft.

Stanley rudder head. Rack and pinion steering. Spade handles. Doublecranked pedal shaft, 6 in . throw. Rubber pedals, plain. Chain driving. Push lever double tyre brake. Adjustable seat rod. Elliptical spring. Cushioned and railed seat. Footrests on frame. Flat wrench. Oilcan. Valise. Lamps. Alarm. Width 39 in ., reducible to 32 in . by taking off the loose wheel. Weight 80 lbs . Hayfork frame.

$$
\text { PRICE .. .. .. .. } 18 \text { 0s. 0d. }
$$

Sent out with plated fittings, rest painted in two colours.
Extras. Two chain double driving, 40s.
Remarks. A lighter and better finished machine than the last, but built on the same lines.

## HIGHLAND MARY.

Samuel Lloyd, Church Lane, Wolverhampton.
Leading Features. Open front. Rear steering. Single driving.
Description. Two 40 in . and one 18in. wheel. Driving wheel 40 in ., running level. $\frac{3}{4}$ in. rubbers. Crescent rims. 50 and 20, No. 11 direct spokes. G.M. hubs. Plain bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, $5 \frac{1}{2}$ in. throw. Rubber pedals, plain. Chain driving. Pull-up lever double tyre brake. Adjustable seat rod. Elliptical spring. Cushioned seat. Footrests on frame. Flat wrench. Oilcan. Pair lamps. Width 36 in ., reducible to 29 in . by taking, off the loose wheel. Weight 801 bs . Hayfork frame.
Price .. .. .. .. £10 0s. 0d.

Sent out with bright spokes and handle fittings, rest painted in two colours. Exxtras. Ball bearings, 40s.
Remarks. A very low-priced machine of the common patters.

## HOWE DIFFERENTIAL.

Howe Machine Co., Bridgeton, Glasgow.


THE HOWE DIFFERENTIAL.

Leading Features. Open front. Rear steering. Single driving. Two speeds for hill work.

Description. Two 44in. and one 17in. wheel. Driving wheel 44in., running as 56 in . and 35 in . ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 52 and 20 , No. 10 direct spokes. G.M. hubs, 6 in . x 4in. Ball bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Spade handles. Doublecranked pedal shatt, 6 in . throw. Rubber pedals, plain. Chain driving, and Warwick's two-speed gear. Push lever double tyre brake. Adjustable $\Gamma$ seat rod. Elliptical spring. Pan seat. Pedals form footrests. Adjustable wrench. Oilcan. Width 4lin. Weight 109lbs. Hayfork frame.

Specialties. Warwick's two-speed gear (page 87).

$$
\text { Price .. .. .. .. } 18 \text { 18s. 0d. }
$$

Sent out with plated hubs, spokes and handle fittings, rest painted in two colours.
Remarks. A strongly built machine of the open fronted class, which drives one wheel for power, the other for speed. (See ddvertisement.)

## HOWE STOP GEAR.

Howe Machine Co., Bridgeton, Glasgow.


THE HOWE STOP GEAR.
Leading Features. Open front. Rear steering. Single driving. Pedals used as footrests.
Description. Two 44in. and one 17in. wheel. Driving wheel 44in., running level. ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 52 and 20, No. 10 nutted spokes. G.M. hubs, $6 \mathrm{in} . \mathrm{x} 4 \mathrm{in}$. Ball bearings to all wheels, and plain to crank shaft. Stanley rudder head. Rack and pinion steering. Spade handles. Doublecranked pedal shaft, 6 in. throw. Rubber pedals, plain. Chain driving and Howe disconnecting gear. Pull-up lever double tyre brake. Adjustable $\Gamma$ seat rod. Elliptical spring. Pan seat. Pedals form footrests. Adjustable wrench. Oilcan. Width 41in., reducible to 35 in . by taking off the loose wheel. Weight 102lbs.

Specialties. Howe stop or disconnecting gear (rage 78).

$$
\text { Price .. .. .. .. } £ 17 \text { 17s. 0d. }
$$

Sent out with plated hubs, spokes, and handle fittings, rest painted in two colours.
Remarks. This is a soundly built rear steerer of the ordinary type, but has an arrangement whereby the chain wheel is thrown out of gear with the driving wheel at will for descending hills; thus it drives both forwards and backwärds equally well, and allows the pedals to be used as footrests also. (See Advertisement.)

## HOWE FRONT STEERER.-D.D.

## Howe Machine Co., Bridgeton, Glasgow.

Leading Features. Front steering. Double driving with balance gear.
Description. Two 50 in . and one 16 in . wheel. Driving wheels 50 in ., running level. ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 58 and 20, No. 10 direct spokes. Iron hubs, 7 in . x $3 \frac{1}{2} \mathrm{in}$. Ball bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade handles. Doublecranked pedal shaft, 6in. throw. Rubber pedals, plain. Chain driving, and Starley's patent double driving gear. Push lever band (7in. x ${ }_{8}^{5} \mathrm{in}$ ) brake. Adjustable $\Gamma$ seat rod. Elliptical spring. Pan seat. Footrests on frame. Flat wrenches. Oilcan. Valise. Width 38in. Weight 95lbs. Loop frame of 1in. 15 gauge weldless steel tube.

Specialties. Starley's balance gear (page 80).

$$
\mathrm{P}_{\mathrm{RICE}} \quad . . \quad . . \quad . . \quad . . \quad £ 23 \quad 0 \mathrm{~s} .0 \text {. }
$$

Sent out with plated hubs, spokes, and handle fittings, rest painted in two colours.
Remarks. A sound built front steerer of the most approved type. It is vertically positioned, and the steering rod is arranged so as to give an equally clear front on either side the steering wheel. (See ddvertisement.)
HUMBER-D.D.

Humber, Marriott \& Cooper, Beeston, Notts.

the Humber Tricycle

Leading Features. Double front steering. Double driving with balance gear. Bicycle action.

Description. Two 44in. and one 17in. wheel. Driving wheels 44in., running as 50 in . $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 56 No. 12, and 24 No. 13 direct spokes. G.M. hubs, $5 \frac{1}{4} \mathrm{in}$. x $3 \frac{1}{4} \mathrm{in}$. Ball bearings to all wheels and crank shaft. Humber rudder head. Humber double steering. Bicycle handles. Bicycle cranks, $5 \frac{1}{2}$ in. throw. Rubber pedals, plain. Central chain driving, and Humber double driving gear. Double grip lever band ( $5 \frac{1}{2} \mathrm{in}$. x lin.) brake. Humber spring. Suspension tricycle saddle. Flat wrenches. Oilcan. Width 40in., reducible to 18 in . by taking off both wheels. Weight 72 l bs. The frame resembles that of a bicycle, having a backbone and rear wheel with front steering head, handles, and cranks and pedals placed in same relative position.

Specialties. Humber double steering (page 63). Humber balance gear(page 82). Plan of machine.

Price .. .. .. .. £23 0s. 0d.
Sent out japanned in two colours.
Extras. Plated fitting 3, 20s.; luggage carrier, 15s.; luggage carrier and footrest combined, 25 s . ; ball pedals, 40 s .
Remarks. This is one of the lightest and fastest machines in the market. It is beautifully finished, and constructed in the best possible manner. It requires a little practice at first to get into the way of it, but when mastered is a good hill-climber and very fast. The five miles path championship was last year won on one by C. E. Liles in the fastest time on record. The firm also build a lady's machine and a sociable, but only to order.

## IMPERIAL CHEYLESMORE RACER-D.D.

Coventry Machinists' Co., Cheylesmore, Coventry.


THE IMPERIAL CHEYLESMORE RACER.

Leading Features. Front steering. Double driving with balance gear. Built for racing.

Description. Two 46in. and one 18in. wheel. Driving wheels 46 in ., running as 56 in . $\frac{1}{2} \mathrm{in}$. rubbers. Club hollow rims. 72 and 22, No. 10 direct butt-ended spokes. Steel hubs, 6 in. Ball bearings to all wheels and crank shaft. Socket rudder head. Rack and pinion steering. Spade handles. Double-cranked hollow pedal shaft, 5in. throw. Rat-trap pedals on ball bearings. Chain driving, and Starley's patent double driving gear. Adjustable seat rod. Racing saddle. Flat wrench. Oilcan. Width 38 in . Weight 50lbs. Loop frame of weldless steel tube. No tilt rods.

Specialties. Starley's balance gear (page 80). Club hollow felloes (page 21). Price .. .. .. .. £28 10s. 0d.

Sent out painted in one colour.
Remarks. A very light, yet strong (for its weight) machine, of the most approved front steering type. It is built specially for racing, and was first introduced last season, when riders on it secured third places with honours in both the five and fifty miles path and road championships. (See Advertisement.)

## IMPERIAI. CLUB-D.D.

Coventry Machinists' Co., Cheylesmore, Coventry.


Leading Features. Front sterring. Double driving with balance gear.
Description. Two 48 in . and one 16 in . wheel. Driving wheels 48 in ., running level. $\frac{3}{3}$ in. rubbers. Crescent rims. 52 and 16 , No. 13 Club spokes. Steel hubs, $5 \frac{1}{4} \mathrm{in}$. $\mathrm{x} 3_{4}^{3} \mathrm{in}$. Ball bearings to all wheels and crank shaft. Socket rudder head. Rack and pinion steering. Spade handles. Double-cranked
pedal shaft, 6 in . throw. Rubber pedals, plain. Chain driving, and Starley's patent double driving gear. Push lever band (6in. x lin.) brake. Adjustable $\Gamma$ seat rod. Suspension spring. Suspension saddle. Footrests on frame. Flat wrench. Oilcan. Wiath 38in. Weight 90lbs. Loop frame of weldless steel tube.

Specialties. Club spokes (page 23). Starley's balance gear (page 80). Suspension spring (page 49). Club adjustable handles-extra (page 59).

$$
\text { Price .. .. .. .. } \quad \text { 24 0s. 0d. }
$$

Sent out with plated fittings, rest painted in two colours.
Extras. Ball pedals, 20s.; Cradle spring, 10s.; Cheylesmore clutch action, 20s.
Remarks. One of the finest front steerers at present on the market. It is vertically built and beautifully made, and may be thoroughly depended on. It has been entirely remodelled and wonderfully improved since last season. (See Advertisement.)

## IMPERIAL ROB ROY.

Zephyr Bicycle \& Tricycle Co., Lower Ford Street, Coventry.


THE IMPERIAL ROB ROY.
Leading F'eatures. Open front. Rear steering. Single driving. No chains or cog wheels.
Description. Two 46 in . and one 18 in . wheel. Driving wheel 46 in ., running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 40 and 20 , No. 10 direct spokes. G.M. hubs, 6 in. x 4 in . Ball bearings to steering wheel, plain to drivers, ball to carrying wheel, and plain to crank shaft. Socket rudder head. Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shaft, 6 in. throw. Rubber pedals, plain. Imperial Rob Roy driving gear. Push lever double tyre brake. Rob Roy brake holder. Adjustable seat rod. Arab Cradle spring. Pan seat. Footrests on frame. Flat wrench. Oilcan. Width 41in. Weight 83lbs. The frame is a flat-backed hayfork of weldless steel tube.

Specialties. Imperial Rob Roy driving gear (page 71). Rob Roy ratchet brake holder (page 99).

$$
\text { PRICE } \because \quad . . \quad . . \quad . \quad £ 20 \text { 0s. 0d. }
$$

Sent out with polished hubs, spokes and handle fittings, rest painted in two colours.

Extras. 44 in . or 46 in . wheels, 10s.; plated fittings, 60 s. ; roller pedals, 30s.; balls to crank ends, 30 s.

Remarks. A very strong and reliable machine, which has no chains to stretch and can be driven equally well both backwards and forwards. (See Advertisement.)

> INDISPENSABLE-D.D.

## H. M. Pashley, Highfield Cycling Depot, London Road, Sheffield.

Leading Features. Front steering. Double driving with balance gear.
Description. Two 50 in . and one 22 in . wheel. Driving wheels 50 in ., running level. $\frac{7}{8}$ in. rubbers. Bell's rims. 50 and 24 , No. 10 direct spokes. G.M. hubs, $6 \mathrm{in} . \mathrm{x} 4 \mathrm{in}$. Ball bearings to all wheels and crank shaft. Stanley (long centre) rudder head. Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shaft, 6in. throw. Rubber pedals, plain. Chain driving, and Starley's patent double driving gear. Push lever band (5in. x lin.) brake. Adjustable $\Gamma$ seat rod. Arab Cradle spring. Long-distance saddle. Footrests on frame. Flat wrenches. Oilcan. Valise. Width 38in. Weight 93lbs. Loop frame of lin. tube, the sides running right up to hold the handles.

Specialties. Bell's rims (page 20).

> Price .. .. .. .. £18 0s. 0d.
> Sent out japanned in two colours.

Extras. Plated spokes, 15s. Plated handle rods, 10 s . Plated hubs, 10 s .
Remarks. I have not yet inspected this machine, so cannot say with confidence what it is like, but I believe it to be a sound and genuine article.

## IROQUOIS.

John F Walters, 47, Queen's Road, Bayswater, London, W.


THE IROQUOIS.

Leading Features. Open front. Rear steering. Single driving.
Description. Two 50in. and one 18in. wheel. Driving wheel 50in., running level. lin. rubbers. Crescent rims. 50 and 18, No. 12 direct spokes. G.M. hubs. Ball bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shaft, 6 in. throw. Rubber pedals, on ball bearings. Chain driving. Pull-up lever double tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Flat wrench. Oilcan. Two lamps. Valise. Width 35in., reducible to 29 in . by taking off the loose wheel. Weight 881 bs . Hayfork frame.

$$
P_{\text {RICE }} \quad . . \quad . . \quad . . \quad . . \quad £ 21 \quad 0 \mathrm{s.} \text {. } 0 \text { d. }
$$

Sent out with plated spokes and handle fittings, rest painted in two colours.
Extras. All plated except rims, £4 4s.

Remarks. A well sent out tricycle, of the open fronted rear steering class. No especial features in detail.

## JUMBO FAVOURITE.

## W. H. Upton, Jumbo Works, Ventnor, Isle of Wight.

Leading Features. Open front. Rear steering. Single driving.
Description. Two 46 in . and one 20in. wheel. Driving wheel 46 in ., running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. No. 11 direct spokes. G.M. hubs, $5 \frac{1}{2}$ in. $x 5$ in. Ball bearings to all wheels, plain to crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pearshaped purchase handle. Double-cranked pedal shaft, 6in. throw. Rubber pedals, plain. Chain driving. Pull-up lever double tyre brake. Adjustable $\Gamma$ seat rod. Elliptical spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Valise. Width 39in., reducible to 32in. by taking off the loose wheel. Weight 80 lbs . Hayfork frame.

$$
\text { Price .. .. .. .. } \quad \text { £16 } 16 \mathrm{~s} . \quad 0 \mathrm{~d} .
$$

Sent out with plated hubs and handle fittings, rest painted in two colours.
Extras. Lamps, 20s.
Remarks. A sound, easy running strong machine of the usual type. (See Advertisement.)

## JUMBO ROADSTER.

## W. H. Upton, Jumbo Works, Ventnor, Isle of Wight.

Leading Features. Open front. Rear steering. Single driving.
Description. Two 40 in . and one 18 in . wheel. Driving wheel 40 in ., running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. No. 11 direct spokes. G.M. hubs, $5 \frac{1}{2} \mathrm{in} . \times 5 \mathrm{in}$. Coned bearings to steering wheel, plain to driver and crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 6 in. throw. Rubber pedals, plain. Chain driving. Pull-up lever back wheel tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Valise. Width 39in., reducible to 32in. by taking off the loose wheel. Weight 84lbs. Hayfork frame.

Price .. .. .. .. £12 12s. 0d.
Sent out painted in two colours.
Remarks. Sound and neat, at a low figure. (See Advertisement.)

## KING OF THE ROAD CLOSING.

A. H. Alldridge, King Edward's Works, Edward Street, Parade, Birmingham.

Leading Features. Open front. Rear steering. Single driving. Direct action. Folding for stowage.

Description. Two 42 in . and one 18 in . wheel. Driving wheel 42 in ., running level. $\frac{7}{8}$ in. and $\frac{3}{4}$ in. rubbers. Crescent rims. 50 and 20 , No. 12 direct spokes. G.M. hubs, 6 in. x $3 \frac{1}{2} \mathrm{in}$. Ball bearings to all wheel N . Stanley rudder head. Rack and pinion steering. Adjustable spade steering handle, and pearshaped purchase handle. Double-cranked axle shaft, $5 \frac{1}{2}$ in. throw. Rubber pedals, plain. Direct driving on the cranked axle. Pull-up lever band (5in. x $\frac{3}{4}$ in.) brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Width 38 in., reducible to 20 in . by Alldridge's patent method. Weight 72lbs. Hayfork frame.

Specialties. Alldridge's method of folding (page 46).
Price .. Sent out japannë in two colours.
Remarks. A machine of very simple construction, which runs easily, and can be stowed away in a very small space.

## KING OF THE ROAD.

Denne \& Co., Station Street, Sittingbourne.
Leading Features. Open front. Rear steering. Single driving.
Description. Two 44 in . and one 18in. wheel. Driving wheel 44 in ., running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 52 and 44, No. 10 direct spokes. Iron hubs, 6 in. by 4 in . Ball bearings to steering wheel, cones to driver, and plain to crank shaft. Stanley rudder head. Rack and pinion steering. Spade handles. Double-cranked pedal shaft, bin. throw. Rubber pedals, plain. Chain driving. Twist handle double tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Pedals form footrests. Two flat wrenches. Oilcan. Bell. Valise. Two lamps. Width 41in., reducible to 33in. by taking off the loose wheel. Weight 851 hs. Hayfork frame.

Specialties. A sliding clutch frees the pedals for descending hills.

$$
P_{\text {rice }} . . \quad . . \quad . . \quad . . \quad £ 16 \quad 0 \mathrm{~s} .0 \mathrm{~d} .
$$

Sent out with plated spokes and handle fittings, rest japanned in two colours.
Remarks. This is a genuinely built machine, and is supplied on easy terms of $£ 210 \mathrm{~s}$. down and 5 s . weekly.

## LADY'S ADVANCE.

James Beech, Gladstone Works, Wolverhampton.
Leading Features. Open front. Rear steering. Single driving.
Description. Two 36 in . and one 18in. wheel. Driving wheel 36 in ., running as 42 in . $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 40 and 20 , No. 11 direct spokes. G.M. hubs. Coned bearings to steering wheel, plain to driver and crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 5in. throw. Rubber pedals, plain. Chain driving. Dress guard. Pull-up lever double tyre brake. *Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Flat wrench. Oilcan. Width 36in., reducible to 29in. by taking off the loose wheel. Weight 801 bs . Hayfork frame.
Price .. .. .. .. £7 10s. 0d.

Sent out painted in two colours.
Remarks. This is about the lowest priced machine in the market.

## LADY'S SPECIAL TIMBERLA KE.

Thos. Timberlake \& Co., 39, King Street, Maidenhead, Berks.
Leading Features. Open front. Rear steering. Single driving. Built for ladies' use.

Description. Two 40 in . and one 18 in . wheel. Driving wheel 40 in ., running level. ${ }^{\frac{3}{4} \mathrm{in}}$. rubbers. Crescent rims. 48 and 18, No. 12 direct spokes. G.M. hubs, 6 in. $x 4 i n$. Ball bearings to steering wheel, plain to driver and crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering.
bandle, and pear-shaped purchase handle. Double-cranked pedal shaft, 5 in . throw. Rubber pedals, plain. Chain driving. Timberlake push lever double tyre brake, and holder. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Flat wrerch. Oilcan. Width 34in., reducible to 28 in . by taking off the loose wheel. Weight 74lbs. Hayfork frame. Dress guard.

Specialties. Wired tyres. Timberlake brake (page 100).

$$
\text { Price .. .. .. .. } 14 \text { 0s. 0d. }
$$

## Sent out with bright spokes and handle fittings, rest painted in two colours.

Extras. Bright parts plated, 40s.; all plated, £5 ; adjustable handles, 15s.; ball bearings to large wheels, 35 s .

Remarks. A soundly built machine, with an exceedingly good feature in the perfect security of the tyres and the efficiency of the brake. Specially constructed for use by the fair sex.

> LADY'S CHEYLESMORE-D.D.


THE LADY'S CHEYLESMORE.
Coventry Machinists' Co., Cheylesmore, Coventry.
Leading Features. Open front. Rear steerin; . Double driving with two chains. Built for ladies' use.

Description. Two 40 in . and one 20 in . wheel. Driving wheels 40 in ., running leve . ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 40 and 20 , No. 13 direct spokes.

Steel hubs, $4 \frac{7}{8} \mathrm{in} . \times 3 \frac{3}{4} \mathrm{in}$. Coned bearings to steering wheel, balls to drivers, and plain to crank shafc. Socket rudder head. Rack and pinion steering. Spade handles. Double-cranked pedal shaft, $4 \frac{1}{2} \mathrm{in}$. throw. Rubber pedals, plain. Chain driving, and Cheylesmore clutch double driving gear. Pull-up swing lever double tyre brake. Adjustable $\Gamma$ seat rod. Suspension spring. Pan seat. Pedals form footrests. Flat wrenches. Oilcan. Width 38in. Weight 80lbs, Hayfork frame of weldless steel tube. Dress guards.

Specialties. Cheylesmore driving clutch (page 75). Club ball bearings (page 37). Swing lever brake (page 97).
Price ..

Sent out with plated fittings, rest painted in two colours.
Extras. Non-slipping tyres, 15s.; adjustable handles, $15 \mathrm{~s} . ;$ ball bearings to back wheel, 20 s.; ball pedals, 20 s . ; Cradle spring, 10 s . ; extra seat for child, 40 s.

Remarks. A light, beautifully-constructed machine, built specially for ladies' use. (See Advertisement.)

LEADER.
G. W. Ash \& Co., 13, Russell Street, Southsea, Portsmouth.


THE LEADER.
Leading Features. Open front. Rear steering. Single driving.
Description. Two 44in. and one 18 in . wheel. Driving wheel 44 in ., running level. ${ }_{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 50 and 20 , No. 10 direct spokes. G.M. hubs, $6 \mathrm{in} . \times 4 \frac{1}{2} \mathrm{in}$. Ball bearings to steering wheel, plain to driver and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable srade handles. Double-cranked pedal shaft, $5 \frac{1}{2} \mathrm{i}$. . throw. Rubber pedals, plain. Chain driving on right-hand side. Leader double tyre and back wheel brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Flat wrench. Oilcan. Lamp. Width 42in., reducible to 3 zain. by taking off the loose wheel. Weight 801 bs. Hayfork frame.

Specialties. Leader adjustable seat and brake (addenda).

$$
\text { Price .. } \quad . \quad . \quad . . \quad £ 17 \quad 17 \mathrm{~s} . \quad 0 \mathrm{~d} .
$$

Sent out painted in three colours.
Remarks. A sound, well constructed machine in every detail, with a novel and effective brake application and seat adjustment. It is fitted with two brakes-the ordinary back wheel spoon for common use, and the Leader double tyre, in which the rider's weight is brought into play for steep hills.

## LEADER No. 2.

G. W. Ash \& Co., 13, Russell Street, Southsea, Portsmouth.

Leading Features. Open front. Rear steering. Single driving.
Description. Two 40 in . and one 20 in . wheel. Driving wheel 40 in ., running as 52 in . $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 40 and 20 , No. 10 direct spokes. G.M. hubs, 6 in . x 4 in . Plain bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, $5 \frac{1}{2}$ in. throw. Rubber pedals, plain. Chain driving. Pull-up lever double tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Flat wrench. Oilcan. Width 36 in ., reducible to 30 in . by taking off the loose wheel. Weight 801bs. Hayfork frame.

$$
\begin{aligned}
& \text { Price .. .. .. .. £12 12s. 0d. } \\
& \text { Sent out painted in two colours. }
\end{aligned}
$$

Remarks. A sound machine of the ordinary type, with no especial features.

## LEDA.

St. George's Foundry Co., Pope Street, Birmingham.
Leading Features. Front steering. Single driving.
Description. Two 40 in . and one 18 in . wheel. Driving wheel $40 \mathrm{in} .$, running level. $\frac{3}{4} \mathrm{in}$. and $\frac{5}{8} \mathrm{in}$. rubbers. Crescent rims. 44 and 18, No. 10 direct spokes. G.M. hubs, $4 \frac{3}{4} \mathrm{in} . \times 3 \mathrm{~m}$. Coned bearings to steering wheel, plain to driver, and ball to crank shaft. Socket rudder head. Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shaft, 6in. throw. Rubber pedals, plain. Chain driving. Push lever doukle band (5in. x $\frac{3}{4}$ in.) brake, with holder. Adjustable $\Gamma$ seat rod. Easy spring. Pan seat. Footrests on frame. Flat wrench. Oilcan. Rapid lubricators. Width 36in., reducible to 31in. by taking off the loose wheel. Weight 78lbs. Loop frame, with tilt rod at back.

Specialties. Easy spring (page 51). Rapid lubricators (page 106).
Price .. .. .. .. £15 15s. 0d.

Sent out with plated handle fittings, rest painted in two colours.
Remarks. A strongly built machine, differing in build from the generality of single drivers, inasmuch as it is arranged as a front steerer. (See Advertisement.)

## LEICESTER SAFETY-D.D.

Leicester Tricycle Co., Station Yard, Leicester.


THE LEICESTER SAFETY.
Leading Features. Front steering. Double driving with balance gear. Bicycle action. Central gear.

Description. Two 46 in . and one 20 in . wheel. Driving wheels 46 in ., running level. $\frac{7}{8} \mathrm{in}$. rubbers. Crescent rims. Direct spokes. G.M. hubs. Ball bearings to steering wheel, plain to drivers and crank shaft. Stanley rudder head.

Leicester thumb steering. Bicycle pattern handles. Bicycle cranks. Rubber pedals, plain. Central chain driving, and Kirby's patent double driving gear. Leicester compensating double tyre brake. Adjustable seat rod. Arab Cradle spring. Long-distance saddle. Footrests on frame. Flat wrench. Oilcan. Valise. Bell. Width 43in. Weight 93lbs. The frame is of T pattern as far as the lower portion goes, but a square frame is carried up in front of the rider on which he rests his arms, the steering handle being just in front; a tilt rod is placed behind, and the saddle is in front of the axle.

Specialties. Peculiarity of frame. Leicester thumb steering (page 60). Kirby's patent balance gear, identical with that described as Hillman's (page 84). Leicester compensating brake (page 96).

$$
\text { Price .. .. .. .. } £ 20 \text { 0s. 0d. }
$$

## Sent out with plated handle fittings, rest painted in two colours.

Remarks. This is one of the most peculiar tricycles in the market, and has many good points. It is a balance-geared double driver and front steerer, and the rider is placed almost in a standing position over his pedals. The brake is very powerful and perfect in equality of action, and the machine may be stopped as suddenly as possible in safety, the safety bar preventing the rider being pitched out in such a case. Mounting and dismounting are done from behind, and the steering is accurate, steady, and sensitive.

## LEICESTER SAFETY FOLDER-D.D.

## Leicester Tricycle Co.. Station Yard, Leicester.



THE LEICESTER SAFETY FOLDER.
Leading Features. Front steering. Double driving with balance gear. Central gear. Bicycle action. Folds for stowage.
Description. Two 46 in . and one 18in. wheel. Driving wheels 46 in ., running level. 7 Iin. rubbers. Crescent rims. Direct spokes. G.M. hubs. Ball bearings to steering wheel, plain to drivers and crank shaft. Stanley rudder head. Leicester thumb steering. Bicycle pattern handles. Bicycle cranks. Rubber pedals, plain. Central chain driving, and Kirby's patent double driving gear. Leicester compensating double tyre brake. Adjustable seat rod. Arab Cradle spring. Long-distance saddle. Footrests on frame. Flat wrenches. Oilcan. Valise. Bell. Width 43in., reducible to 15in. by use of Leicester folding frame. Weight 95lbs. The frame is identical with the last, save in the
arrangements for folding, a full description of which will be found on page 43.
Specialties. Peculiarity of frame. Leicester thumb steering (page 60). Kirby's balance gear. Leicester compensating brake (page 96). Leicester folding frame (page 43).

Price .. .. .. .. £22 0s. 0d.
Sent out painted in two colours.
Remarks. As rigid when in running order as the rigid machine just described. It has all the same peculiarities, with the additional advantage of the folding frame.

## LEOPOLD.

Burnett \& Co., Hunslet New Road, Leeds.
Leading Features. Single driving. Narrow frame.
Description. Two 24 in . and one 48 in . wheel. Driving wheel 48 in . running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 48 and 24 , No. 10 direct spokes. G.M. hubs. Coued bearings to steering wheels, plain to driver and crank shaft. Stanley rudder head. Rack and pinion steering, and castor wheel. Spade handles. Double-cranked pedal shaft, 6in. throw. Rubber pedals, plain. Chain driving. Twist band brake. C spring. Suspension saddle. Adjustable wrench. Oilcan. Width 32 in . Weight 85 lbs . The frame is identical with that of the Coventry Rotary, No. 2, but the rear-most side wheel fork is bent back so as to cause the wheel to act like a castor.

Specialties. Castor wheel steering.

$$
\begin{gathered}
\text { Price } \\
\text { Sent out painted in two colours. }
\end{gathered}
$$

Extras. Plated bright parts, 50s.; all plated, £5; ball bearings to small wheels and cranks, £3.
Remarks. This is built à la Coventry Rotary, but in place of the double steering the front wheel only is actuated by the stemring rod, the rear whee acting like a castor and following fairly well in its track.

## LYNN EXPRESS.

## Jaites Plowright, Railway Road, Lynn.

## Leading Features. Open front. Rear steering. Single driving.

Description. Two 48 in . and one 1 in. wheel. Driving wheel 48 in , running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 50 and 20 , No. 11 direct spokes. G.M. hubs, $5 \frac{1}{2}$ in. x 5 in. Ball bearings to steering wheel, plain to driver and crank shaft. Stanley rudder head. Rack aud pinion steering. Spade handles. Double-cranked pedal shaft, 6 in . throw. Rubber pedals, plain. Chain driving. Pull-up lever double tyre brake. Adjustable seat rod. B spring. Woolley's spring saddle. Footrests on frame. Adjustable wrench. Oilcan. Width 36 in ., $\mathrm{r} \in$ ducible to 29 in . by taking off the loose wheel. Weight 801 lbs . Hayfork frame.

$$
\text { Price .. .. .. .. .. } 16 \text { 16s. 0d. }
$$

Sent out painted in two colours.
Extras. Ball bearings to large wheels, 40s.
Remarls. A strongly built, sound machine, with no especial features.
MARKHAM-D.D.

## Arthur Mariham, 345, Edgware Road, London.

Leading Features. Front steeriag. Double driviag with balance gear. Central gear.

Description. Two 48 in . and ne 16 in . wheel. Driving wheels $48 \mathrm{in} .$, running level. $\frac{7}{8}$ in. and $\frac{3}{4}$ in. rubbers. Crescent rims. 50 and 20, No. 11 direct spokes. G. M. hubs. 6in. x 4in. Eolus ball hearings to all wheels, plain to cranks. Stanley rudder head. Rack and pinion steering. Adjustable spade handles. Adjustable detachable bicycle cranks. Rubber pedals, on ball bearings. Central
chain driving, and Markham's double driving gear. Push lever band (7in. $\left.\times 1 \frac{1}{2} \mathrm{in}.\right)$ brake. Adjustable $\Gamma$ seat rod. Elliptical spring. Tricycle saddle. Footrests on frame. Adjustable wrench. Oilcan. Width 38 in . Weight 81lbs. The frame is tybular and of the $T$ variety, very neat, light, and simple.

Specialties. Markham's balance gear (page 81).


THE MARKHAM.
Price .. .. .. .. £21 0s. 0d.
Sent out with bright spokes and plated handle fittings, rest painted in two colours.

Remarks. This is a very light front steering double driver. It is quick in action, handy, neat, and easy rumning, and although not as highly finished as some is soundly constructed and well put together.

## MARKHAM SOCIABLE-D.D.

## Arthur Markhamt, 345, Edgware Road, London.

Leading Features. Front steering. Double driving with balance gear. Clear frontage for each rider.

Description. Two 48 in . and one 13 in . wheel. Driving wheels 48 in ., running level. lin. and $\frac{7}{8}$ in. rubbers. Crescent rims. 54 and 24, No. 10 direct spokes. G.M. hubs, 6 in . x 4 in . Æolus ball bearings to all wheels, plain to cranks. Stanley rudder head. Rack and pinion steering. Adjustable spade handles. Detachable bicycle cranks. Rubber pedals on Æolus ball bearings. Central chain driving, and Markham's double driving gear. Push lever band (7in. x $1 \frac{1}{2}$ in.) brake. Adjustable $\Gamma$ seat rods. Elliptical springs. Pan seat and Longdistance saddle. Footrests on frame. Adjustabie wrench. Oilcan. Width 60 in . Weight 1291 lbs . The frame resembles a loop for a single machine, with the top cross tube extended a foot on each side. Each rider has a chain centrally, and the steering gear is between the two.

Specialties. Frame. Markham's balance gear (page 81).
Price .. .. .. .. £26 0i. 0d.

Sent out with bright srokes and plated handle fittings, rest painted in two colours.

Remarks. This is a very light sociable, the frame being exceedingly simple and ingenious. I have not tried it yet, but should fancy it to run easily and well.

## MERCURY.

## Mercury Machinssts' Co., Aston Road, Birmingham.

Leading Features. Open front. Rear steering. Single driving.
Description. Two 44 in . and one 18 in . wheel. Driving wheel 44 in ., running level. $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. Direct spokes. G.M. hubs. Plain bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 6in. throw. Rubber pedals, plain. Chain driving. Pull-up lever double tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Flat wrench. Oilcan. Valise. Width 37in., reducible to 30 in . by taking off the loose wheel. Weight 77 lbs . Hayfork frame.

$$
\begin{array}{ccccccc}
\text { Price } & . . & \ldots & . . & \ldots & \text {.. } \\
& \text { Sent out painted in two colours. }
\end{array}
$$

## Extras. Ball bearings, 20s. per wheel.

Remarks. Made of good material throughout. A sound machine with no special features.

METEOR No. 1.
Starley \& Sutton, Meteor Works, West Orchard, Coventry.

the Meteor no. 1.

Leading Features. Open front. Rear steering. Single driving.
Description. Two 40 in . and one 18 in . wheel. Driving wheel 40 in ., running level. ${ }_{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 50 and 24 , No. 11 direct spokes. G.M. hubs. Hardened plain bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 6in. throw. Rubber roller pedals. Chain driving. Push lever double band (7in. x $\frac{3}{4} \mathrm{in}$.) brake. Adjustable $\Gamma$ seat rod. Elliptical spring. Pan seat. Footrests on frame. Flat wrench. Oilcan. Width 39in., reducible to 30 in . by taking off the loose wheel. Weight 75lbs. Hayfork frame.

Specialties. Starley's driving chain (page 70). Starley's roller pedals (page 27). Harrington's enamel (page 123).
Price .. .. .. .. £17 0s. 0d.

Sent out with plated handle fittings, rest enamelled plain black in Harrington's enamel.
Extras. Lining in colours, 12s. 6d. ; gold lining, 25s.
Remarks. The first machine to be built on these lines, its saccess caused others to copy, with the result that this pattern is the most common in the market. It is well and strongly built, and all wearing parts are thoroughly hard. It will be found a first-class machine of the type. Some thousands are now in use.

METEOR No. 2-D.D.
Starley \& Sutton, Meteor Works, West Orchard, Coventry.


THE METEOR NO.' 2.
Leading Features. Front steering. Double driving with balance gear.
Description. Two 46 in . and oue 16 in . wheel. Driving wheels 46 in ., running level. $\frac{7}{8}$ in. and $\frac{3}{4}$ in. rubbers. Crescent rims. 56 and 24 , No. 11 direct spokes.
G.M. hubs. Ball bearings to steering wheel, plain to drivers and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shaft, 6 in . throw. Rubber roller pedals. Chain driving, and Starley's patent double driving gear. Push lever band (7in. x $\frac{3}{4} \mathrm{in}$.) brake. Adjustable $\Gamma$ seat rod. Elliptical spring. Pan seat. Footrests on frame. Flat wrench. Oilcan. Width 39in. Weight 901 lbs . Loop frame.
等Specialties. Starley's driving chains (page 70). Starley's balance gear (page 80). Meteor roller pedals (page 27). Harrington's enamel (page 123).
Price .. .. .. .. £20 10s. 0d.

Sent out with plated handle fittings, rest enamelled plain black in Harrington's enamel.
बFI Extras. Lining in colour 12s. 6d., in gold 25s. ; ball bearings all over, 60s. ; hulf plated, 60 s. ; all plated, £10.

Remarks. A lightly built front steerer of good material, with the weight rather more forward than usual to give greater steadiness of steering. Fully vertical action. A first-class machine in every way. The firm's leading brand this season.

> METEOR SOCIABLE-D.D.

Starley \& Sutton, Meteor Works, West Orchard, Coventry.

the meteor sociable.
Leading Features. Front steering. Double driving with balance gear.
Description. Two 46 in . and one 20 in . wheel. Driving wheels $46 \mathrm{in} .$, running level. $1 \frac{1}{4} \mathrm{in}$. and $\frac{7}{8} \mathrm{in}$. rubbers. Crescent rims. 52 and 24, No. 10 direct spokes. G.M. hubs. Plain bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Meteor adjustable spade steering handle, and pear-shaped purchase handles. Double-cranked pedal shaft. Rubber roller pedals. Chain driving, and Starley's patent double driving gear. Push lever band (8in. x $1 \frac{1}{8} \mathrm{in}$.) brake, with holder. Adjustable $T$ seat rods. Elliptical springs. Pan seats. Footrests on frame. Adjustable wrench. Oilcan.

Width 63in. Weight 1391bs. The frame is of steel tube, and consists of a main cross tube with short side arms to carry the crank ends, and a long central tube going straight out to the rudder wheel.

Specialties. Frame. Meteor roller pedals (page 27). Starley's driving chains ( $p .2 g e 70$ ). Starley's balance gear (page 80). Meteor adjustable handles (page 59). Meteor brake holder. Harrington's enamel (page 123).

$$
\text { Price .. .. .. } \quad . . \quad £ 26 \text { 0s. } 0 \text { d. }
$$

Sent out enamelled plain black in Harrington's enamel.
Extras. Lining in colours, $15 \mathrm{~s} \cdot$; in gold, 30 s .; ball bearings all over, 80 s .
Remarks. This is one of the most successful sociables in the market. It is extremely rigid and steady in running, especially at speed and down hill, owing chiefly to the rudder being so far ahead. The brake power is enormous, and the machine makes a first-class club "'bus" by reason of its stability. The addition of the balance gear to it this season is a vast improvement.

## MAZEPPA No. 1-D.D.

Metropolitan Machinists' Co., 75̆, Bishopsgate Street Without, London, E.C.

the mazeppa no. 1.
Leading Features. Front steering. Double driving with single chain.
Description. Two 50in. and one 18 in . wheel. Driving wheels 50 in ., running level. ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 50 and 20, No. 11 direct spokes. G.M. hubs. Coned bearings to steering wheel, plain to drivers and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shaft, 6 in. throw. Rubber roller pedals. Chain driving, and Lewis's double driving gear. Push lever band brake. Adjustable seat rod. Scroll spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Lamp. Bell. Valise. Width 41in. Weight 9ylbs. Loop frame, with tilt rod at side.
Price .. .. .. .. £17 15ss. 0d.

Sent out with bright spokes and handle fittings, rest painted in two colours.
Extras. Ball bearings, 25 s .; half plated, 60 s.

## MAZEPPA No. 2.

Metropolitan Machinists' Co., 75, Bishopsgate Street Without, London, E.C.
Leading Features. Open front. Rear steering. Single driving.

Description. Two 44 in . and one 20 in . wheel. Driving wheel 44 in . running as 55 in . ${ }_{5}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 50 and 20 , No. 11 direct spokes. G.M. hubs. Coned bearings to steering wheel, plain to driver and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 6 in. throw. Rubber pedals, plain. Chain driving. Pull-up lever double tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Flat wrench. Oilcan. Valise. Two lamps. Bell. Width $39 \mathrm{in} .$, reducible to 32 in . by taking off the loose wheel. Weight 84 lbs . Hayfork frame.

$$
\text { Price . .. .. .. .. } £ 15 \text { 0s. 0d. }
$$

Sent out with bright spokes and handle fittings, rest painted in two colours. Remarks. An open frouted rear steerer,

> MERLIN-A.D.

Bricknell \& Co., Merlin Enginesring Works, Brixton Rise, London, S.W.


Leading Features. Open front. Rear steering. Lever action. Alternate driving, length of stroke at will.

Description. Two 36 in . and one 18 in . wheel. Driving wheels 36 in ., running from 30 in . to 67 in . $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. red rubbers. Crescent rims. 40 and 20, No. 12 direct spokes. G.M. hubs, $3 \frac{1}{4} \mathrm{in}$. $\times 3 \frac{1}{4} \mathrm{in}$. Aolus ball bearings to all wheels. Stanley rudder head. Rack and pinion steering. Adjustable spade handle, and pear-shaped purchase handle. Rubber pedals, without bearings. Merlin levers. Merlin driving gear. Lever double tyre brake. Adjustable seat rod. Cradle spring. Pan seat. Wrench. Oilcan. Weight 72lbs. Width 3õin. The frame is a hayfork of thick steel tube, the ends of which carry the lever fulcra, and rods depend from the bearings bearing "stops" to limit the stroke and convert the pedals into footrests.

Specialties. Merlin levers (page 66). Merlin driving gear (page 80).
Price .. .. .. .. £19 19s. 0d.

## Sent out with plated handle fittings, rest painted in two colours.

Remarks. This is a last season's novelty, and is well and neatly made. It drives each wheel alternately, or both together, but cannot be driven backwards. The driving cords can be adjusted for heavy or light work, so as to gear up to any desired point. It is a handy machine, and capable of good speed, doing 3.58 for the mile at its first appearance on the path. It has been much improved since its first introduction in the construction of the gearing, clutches, \&c., \&c., which are made neater, lighter, and more effective. (Sce Advertisement.)

## METO.

G. Hughes, Temple Street, Wolverhampton.

Leading Features. Open front. Rear steering. Left-hand steering.
Description. Two 44in. and one 20 in . wheel. Driving wheel 44 in ., running as 50 in . $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. red rubbers. Crescent rims. 52 and 24 direct spokes. G.M. hubs, 5in. x $4 \frac{1}{2}$ in. Parallel bearings to driver, and balls to steering wheel. Stanley rudder head. Left-hand rack and pinion steering. Adjustable spade handle, and pear-shaped purchase handle. Double-cranked pedal shaft, running in plain bearings. Rubber pedals, on plain bearings. Chain driving. Lever band brake. Adjustable seat rod. Scroll spring. Cushioned seat. Footrests on frame. Wrench. Oilcan. Weight 80lbs. Width 37in. Hayfork frame.

Price .. .. .. .. £12 0s. 0d.
Sent out painted in two colours.
Remarks. A sound article at the price.

## MINOTAUR-D.D.

Alpe Bros., Baker Street, Hull.

## Leading Features. Front steering. Double driving. Central gear.

Description. Two 48 in . and one 20 in . wheel. Driving wheels 48 in ., running level. ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 and 20 , No. 11 direct spokes. G.M. hubs, $6 \mathrm{in} . \mathrm{x} 4 \mathrm{in}$. Ball bearings to all wheels and crank shaft. Socket rudder head. Rack and pinion central steering. Adjustable spade steering handle, and pear-shaped purchase handle. Bicycle cranks, 6 in. throw. Rubber pedals, plain. Central chain driving, and Minotaur double driving gear. Push lever band ( $4 \frac{1}{4} \mathrm{in} . \times 1 \frac{1}{\mathrm{~g}} \mathrm{in}$.) brake. Adjustable $\Gamma$ seat rod. Elliptical spring. Long-distance saddle. Footrests on frame. Two flat wrenches. Oilcan. Valise. Width 40 in . Weight 75 lbs . Tubular 7 frame.

Specialties. Minotaur double driving gear.
Price .. .. .. .. .. £20 0s. 0d.

Sent out with plated handle fittings, rest painted in two colours.
Remarks. An exceedingly simple, light and neat machine. Appears strong and soundly built. It is a front steering double driver, and has all the gear placed centrally between the legs so as to give equal clearance on either side.

## MONARCH D.D.

W. T. Eades, John Bright Street, Birmingham.



THE MONARCE.
Leading Features. Open front. Rear steering. No chains or cog wheels. Double driving by means of ratchets.

Description. Two 40 in . and one 16 in . wheel. Driving wheels 40 in ., running level. $\frac{7}{8} \mathrm{in}$. non-slipping rubbers. Crescent rims. 52 and 20 , No 11 direct spokes. G.M. hubs, 5in. x 5in. Double ball bearings to crank shaft, and Æolus balls to steering wheel. Stanley rudder head. Rack and pinion steering. Spade handle. Pear-shaped purchase handle. Double-cranked axle, driven direct with rubber hanging pedals on ball bearings. Ratchet double driving gear. Double tyre brake. Adjustable seat rod. Elliptical spring. Woolley's patent saddle. Wrench. Oilcan. Valve lubricators. Weight 70lbs. Width $38 \mathrm{in} .$, but can be passed through a 2 ft . doorway. Tubular square-backed hayfork frame.

Specialties. Monareh eccentric stirrup pedals (page 68). Monarch clutches (addenda).
Price .. .. .. .. £18 18s. 0d.

Sent out paint $\in d$ all over in two colours.
Extras. Plated spokes and fittings, 70 s . With plain bearings, 42 s . less.
Remarks. This machine is well made and light. The driving arrangement does away with a second crank shaft and its friction, also that of the chain, and whilst driving direct upon the wheels, the rider is placed no higher than on an ordinary machine; the centre of gravity being consequently kept low. The small wheels make it a good hill climber, and the running is easy.

## NATIONAL.

National Bicycle \& Tricycle Co., Spon Street, Coventry.
Leading Features. Front steering. Single driving.
Description. Two 44 in . and one 18 in . wheel. Driving wheel 44in., running level. $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 and 20, No. 12 direct spokes. G.M. hubs. Plain bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 6in. throw. Rubber pedals, plain. Chain driving. Lever band brake. Adjustable seat rod. Elliptical spring.

Pan seat. Footrests on frame. Flat wrench. Oilcan. Width 41in. Weight 911 bs . Loop frame, with tilt rod.
Price .. .. .. .. £12 12s. 0d.

Sent out with plated handle fittings, rest painted in two colours.
Remarks. A single driver, built as a front steerer, at a very low figure. (See Advertisement.)

NATIONAL No. 5-SEMI-D.D.
National Bicycle and Tricycle Co., Spon Street, Coventry.

the national no. 5.
Leading Features. Open front. Rear steering. Direct action. Frictional double driving.

Description. Two 40 in . and one 24 in . wheel. Driving wheels 40 in ., running level. $\frac{1}{13} \frac{1}{6}$ in. rubbers. Crescent rims. Direct spokes. G.M. hubs. Plain bearings throughout. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked axle shaft, $5 \frac{1}{2} \mathrm{in}$. throw. Rubber pedals, plain. Direct driving, and Lawson's coned clutch double driving gear. Pull-up lever back wheel tyre brake. Adjustable $\Gamma$ seat rod. C spring. Dan seat. Footrests on frame. Flat wrench. Oilcan. Width 39in. Weight s0lbs. The frame is of the hayfork variety, constructed of flat bar iron body with a tubular backbone.

Specialties. Lawson's coned driving clutch (page 79). Direct action.

$$
\text { Price .. .. .. .. } \quad £ 10 \text { 10s. } 0 \text { d. }
$$

Sent out with plated handle fittings, rest painted in two colours.
Remarks. This machine drives direct on the cranked axle, and places the rider high. The back wheel brake is applied by a chain and grip lever, and whilst one wheel is fast to the crank shaft, the other is driven in all straight running by a frictional cone. (See Advertisement.)

## NATIONAL ROYAL-SEMI-D.D.

## National Bicycle \& Tricycle Co., Spon Street, Coventry.

Leading Features. Open front. Rear steering. Direct action. Frictional double driving.

Description. Two 40in. and one 18 in . wheel. Driving wheels 40 in ., running level. $\frac{113 i n}{16} \mathrm{in}$. rubbers. Crescent rims. 60 and 20, No. 12 direct spokes. G.M. hubs. Ball bearings to steering wheel and driving shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked axle shaft, $5 \frac{1}{2}$ in. throw. Kubber pedals, plain. Direct driving, and Lawson's coned clutch double driving gear. Push lever double band (7in. $x \frac{3}{4} \mathrm{in}$.) brake. Adjustable $\Gamma$ seat rod. C spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Valise. Width 39in. Weight 54 lbs . Hayfork frame of steel tube.


NATIONAL ROXAL.
Specialties. Direct driving. Lawson's coned driving clutch (page 79). Price .. .. .. .. .. £21 0s. 0d.
Sent out with plated spokes and handle fittings, rest painted in two colours.
Remarks. This is an exceedingly light machine, and as it has the same bearings as a bicycle, and drives direct upon the wheels, it runs very easily and climbs hills well. The method of driving places the rider in a much higher position than on most tricycles. It is sent out highly finished and well got up. (S'ee Advertisement.)

## NATIONAL SOCIABLE TANDEM-D.D.

National Bicycle \& Tricycle Co., Spon Street, Coventry.



THE NATIONAL SOCLABLE TANDEII.

Leading Features. Open front. Rear steering. Independent double driving.
Description. Two 46 in . and one 22 in . wheel. Driving wheels 46 in ., running level. ${ }_{8}^{7}$ in. rubbers. Crescent rims. 60 and 24, No. 12 direct spokes. G.M. hubs. Coned bearings to steering wheel, plain to drivers and crank shafts. Stanley rudder head. Rack and pinion steering. Spade steering handle, pearshaped and bicycle pattern purchase handles. Double-cranked pedal shafts, 6in. throw. Rubber pedals, plain. Double chain driving. Push lever double band (7in. $\times \frac{3}{4} \mathrm{in}$.) brake. Adjustable $\Gamma$ seat rods. Elliptical springs. Pan seat, and Long-distance saddle. Footrests on frame. Adjustable wrench. Oilcan. Width 39 in . Weight 125lbs. The frame is a tubular hayfork with very long backbone on which a socket is brazed half way in which works a seat rod for a second rider, who is provided with a pair of cranks and chain attached to the fore part of the machine.

## Specialties. General plan.

Price .. .. .. .. £20 0s. 0d.

Sent out with bright spokes and handle fittings, rest painted in two colours.
Extras. Ball bearings and plated bright parts, $£ 5$; canopy and shield, $£ 310$ s.
Remarks. This is about the simplest Tandem Sociable in the market, and may briefly be described as placing a male rider astride the backbone of a rear steering tricycle, with the lady occupying the front seat. (See Advertisement.)

## NATIONAL SPECIAL-D.D.

National Bicycle \& Tricrcle Co., Spon Street, Coventry.


THE NATIONAL SPECLAL.
Leading Features. Front steering. Double driving with ratchet gear. Back pedalling clutch.

Description. Two 46 in . and one 18 in . wheel. Driving wheels 46 in ., running level. $\frac{1}{1} \frac{1}{2} \mathrm{in}$. and $\frac{3}{1} \mathrm{in}$. rubbers. Crescent rims. 60 and 20 , No. 12 direct spokes. G.M. hubs. Ball bearings to all wheels, and plain to crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pearshaped purchase handle. Double-cranked pedal shaft, 6in. throw. Rubber pedals, plain. Chain driving, and ratchet double driving gear. Push lever doub'e band (7in. $x \frac{3}{4}$ in.) brake. Adjustable $\Gamma$ seat rod. Elliptical spring. Long-distance saddle. Pedrls form footrests. Adjustable wrench. Oilcan. Valise. Width 41 in . Weight 951 lbs . Loop frame, with tilt rod at side.

Specialties. Coned clutch for back-pedalling.

$$
\text { Price .. .. .. .. } £ 18 \text { 0s. 0d. }
$$

Sent out with brigkt spokes and handle fittings, rest painted in two colours. Extras. Plated bright parts, 40s.

Remarks. This machine is a front steerer, and drives the through axle with one chain, the axle propelling both wheels with clutches, whilst for back-pedalling purposes a separate handle brings a coned friction clutch into action with one wheel, and the machine is driven backwards. (See Advertisement.)

## NEMO No. 1.

## Highbury Machine Co., 33, Holloway Road, London, N.

## Leading Features. Open front. Rear steering. Single driving.

Description. Two 40 in . and one 18in, wheel. Driving wheel 40 in ., running level. ${ }_{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 and 30 , No. 11 direct spokes. G.M. hubs, 6 in. $\times 4 i n$. Coned bearings to steering wheel, plain to driver and crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 6 in . throw. Rubber pedals, plain. Chain driving. Pull-up lever double tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. F'ootrests on frame. Flat adjustable wrench. Oilcan. Valise. Pair lamps. Width 38in., reducible to 28in. by taking off the loose wheel. Weight 781bs. Hayfork frame.
Price .. .. .. .. £15 0s. 0d.

Sent out with bright spokes and handle fittings, rest painted in two colours.
Extras. Ball bearings, 40 s. ; plated fittings, 40 s .
Femarks. A machine of the common type, with no especial features.
NEMO No. 4-D.D.


THE NEMO No. 4.
Highburx Machine Co., 33, Holloway Road, London, N.
Leading Features. Front steering. Double driving with balance gear.
Description. Two 46 in . and one 18in. wheel. Driving wheels 46 in ., running level. lin. and ${ }_{8}^{7} \mathrm{in}$. rubbers. Crescent rims. 50 and 20 , No. 12 direct spokes. G.M. hubs. Plain bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spadehandles. Double-cranked pedal shaft, 6in. throw. Rubber pedals, plain. Intermediate ball wheel gear, and :tarley's patent double driving gear. Push lever band ( $5 \frac{1}{2} \mathrm{in} . \times 1 \mathrm{in}$.) brake. Adjustable seat rod. Special Salvo style spring. Cushioned seat. Footrests on frame.

Adjustable wrench. Oilcan. Valise. Lamp. Width 42in. Weight 90lbs. Loop frame.

Specialties. Intermediate ball wheel gear (page 70).
Price .. .. .. .. .. £19 19s. 0d. Sent out painted in two colours.
Extras. Æolus ball bearings to front wheel, 15 s .
Remarks. A remarkably easy running machine. Built with fair verticality and of sound material.

## NEW MERLIN-D.D.

Bricknell \& Co., Merlin Engineering Works, Brixton Rise, London, S.W.
Leading Features. Front steering. Double driving with balance gear. Folding for stowage. Lever action. Two speeds at will.

Description. Two 42 in . and one 18 in . wheel. Driving wheels $42 \mathrm{in} .$, running as 60 in . and 45 in . $\frac{3}{4} \mathrm{in}$. and $\frac{5}{8} \mathrm{in}$. rubbers. Crescent rims. 50 and 20 , No. 13 direct spokes. G.M. hubs, 5in. x $3 \frac{1}{2} \mathrm{in}$. Æolus ball bearings to all wheels. Stanley rudder head. Rack and pinion steering. Instantaneously adjustable spade handles. Rubber pedals, without bearings. Merlin lever driving gear, with new clutch, and Starley's double driving gear. Screw-up band ( $6 \mathrm{in} . \times 1 \frac{1}{4} \mathrm{in}$.) brake. Adjustable seat rod. S spring. Long-distance saddle. Pedals form footrests. Adjustable wrench. Uilcan. Width 35in., reducible to 29 in . by telescoping the hubs. Weight 79lbs. T frame of weldless steel tube.

Specialties. New two-speed arrangement (addenda). Instant handle adjustment (page 59). Merlin driving levers (page 66). Merlin driving gear (page 80). New clutch, very similar to Cheylesmore. New telescopic hubs.

Price .. .. .. .. £22 0s. 0d.
Sent out with plated handle fittings, rest painted in two colours.
Remarks. This machine has quite a host of good features, and has only just been perfected. The addition of balance gear makes it very much steadier than with alternate driving. The variable stroke of the Merlin driving action actuates the gear box which drives the wheels, whilst the instantaneous adjustment of the handles and driving power are especial advantages. It is well and scientifically put together, and is a very different machine now to the first ones shown at the Stanley Exbibition (See Advertisement).

## NEW MERLIN SOCIABLE-D.D.

Bricknell \& Co., Merlin Engineering Works, Brixton Rise, London, S.W.
Leading Features. Front steering. Independent double driving. Lever action. Variable stroke and speed.

Description. Two 42 in . and one 18 in . wheel. Driving wheels 42in., running as 60 in . and 45 in . lin. rubbers. Crescent rims. 50 and 20 , No. 11 direct spokes. G.M. hubs, 6 in. $\times 4 \frac{1}{2} \mathrm{in}$. Жolus ball bearings to steering wheel, rollers to drivers. Stanley rudder head. Rack and ninion steering. Instantaneously adjustable spade handles. Merlin driving levers. Rubber pedals without bearings. Lever driving, and Merlin clutch driving gear. Screw-up double band ( $6 \mathrm{in} . \times 1 \frac{1}{4} \mathrm{in}$. ) brake. Adjustable seat rods. S springs. Tricycle suspension saddles. Pedals form footrests. Flat wrench. Oilcan. Width 60 in . Weight 1491bs. The frame is of steel tube, very much after the loop variety, with extended top sides and fulcra at back for the levers to work upon.

Specialties. Merlin instant adjustable handles (page 59). Merlin levers (page 66). Merlin driving gear (page 80). Doubly balanced band brake.
Price .. .. .. .. .. .. £31 10s. 0d.

Sent out with plated handle fittings, rest painted in two colours.
Remarks. I have not tried this machine yet, but take it to be a thorough success. The low wheels should give great steadiness and stability, whilst the instantaneous adjustability of the handles is a great point (See Advertisement.)

## NONPAREIL—D.D.

J. Stassen \& Son, 251, Euston Road, London. N.W.


THE NONPAREIL.
Leading Features. Front steering. Double driving with balance gear. Central gear. Telescopes for stowage.

Description. Two 48 in. and one 18 in . wheel. Driving wheels 48 in , running level. ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Cressent rims. 64 and 24, No. 12 direct spokes. G.M. hubs, $5 \frac{1}{2}$ in. $x ~ 3 \frac{1}{2}$ in. Ball bearings to all wheels and cranks. Stanley rudder head. Stassen's rack and pinion steering. Adjustable spade handles. Bicycle cranks. Rubber pedals on ball bearings. Central chain driving, and Stassen's double driving gear. Pull-up lever band brake. Adjustable $\Gamma$ seat rod. Arab Cradle spring. Long-distance saddle. Hinged footrests on frame. Adjustable wrench. Oilcan Valise. Width 39in., reducible to 28in. by Stassen's method. Weight 85lbs. T frame of weldless steel tube.

Specialties. Stassen's balance gear. Stassen steering gear (page 62). Stassen's telescopic arrangement (page 46).

$$
\text { Price .. .. .. .. } \quad £ 21 \quad 0 \mathrm{~s} . \quad 0 \mathrm{~d} .
$$

Sent out with plated handle fittings, rest painted in two colours.
Remarks. This machine is beautifully and substantially made. It is a front steering double driver, with a balance gear of a peculiar nature, and is the most rigid collapsible machine in the market, the telescoping being quicker done than with any other machine, and not affecting stability in the slightest.

## NORTHAMPTON No 1.

E. Gadsby, 24 and 26, Bearward Streєt, Northampton.

Leading Features. Front steering. Unequal wheels.
Description. Wheels $50 \mathrm{in} ., 26 \mathrm{~m}$., and 16 in . Driving wheel 50 in ., running as 43 in . ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 50,26 , and 16 , No. 11 locknutted spokes. Iron hubs, $6 \mathrm{in} . \times 4 \frac{1}{2} \mathrm{in}$. Roller bearings to driver, and cones to steering wheel. Open centre rudder head. Rack and pinion steering. Spade handle. Pear-shaped purchase handle. Double-cranked pedal shaft, running in roller bearings. Rubber pedals on plain bearings. Chain driving. Powerful lever and band brake. Adjustable seat rod. Elliptical spring.


THE NORTHAMPTON No. 1.
Cushioned seat. Footrests on frame front. Wrench. Oilcan. Lamp. Valve lubricators. Weight 881 lbs . Width 33in., reducing to 27 in . by removing the loose wheel. The frame is a long tubular bow with handles curving forwards at top, and long wheel base as shown in the illustration.

Specialties. Frame and general construction.
Price .. .. .. .. .. £14 0s. 0d.
Sent out japanned in black, with gold lines.

Remarks. This is a strong well made machine, and the arrangement of the steering rod makes it exceedingly open in front, for a front steerer. The rider is well over his work, and can stand on his pedals for hill work. Equal side wheels are fitted if preferred. (See Advertisement.)

NORTHAMPTON No. 2.
E. GADSBy, 24 and 26, Bearward Street, Northampton.


## Leading Features. Open front. Rear steering.

Description. Two 44in. and one 20 in . wheel. Driving wheel 44 in . running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 44 and 20 , No. 11 lock-nutted spokes. Iron hubs, 6 in . x $4 \frac{1}{2} \mathrm{in}$. Plain bearings to driver, and cones to steering wheel. Open centre rudder head. Rack and pinion steering. Spade handle. Pearshaped purchase handle. Double-cranked pedal shaft, running in roller bearings. Kubber pedals on plain bearings. Chain driving. Spoon brake. Adjustable seat rod. Elliptical spring. Cushioned seat. Footrests on frame. Wrench. Oilcan. Lamp. Valve lubricators. Weight 83lbs. Width 34in., reducing to 28 in . by taking off the loose wheel. The frame is a hayfork, very much arched, so as to make a graceful outline and gain strength.

$$
\text { Price .. .. .. .. } £ 14 \text { 0s. } 0 \text { d. }
$$

Sent out japanned and gold lined.
Remarks. This machine, when made for ladies' use, has 40 in . wheels, geared down to 36 in ., and is fitted with chain guards at the same price. (See Advertisement.)

## NOTTINGHAM TELESCOPIC-D.D.

## Notitingham Tricycle Co., Hockley Mill Works, Nottingham.



THE NOTTINGHAM TELESCOPIC.
Leading Features. Double front steering. Double driving with balance gear. Telescopes for stowage. Bicycle action.

Description. Two 44in. and one 18in. wheel. Driving wheels 44in., running as 50 in . $7_{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 50 and 24 , No. 11 direct spokes. G.M. hubs, 6 in . x $3 \frac{1}{2} \mathrm{in}$. Ball bearings to all wheels and cranks. Stanley rudder head. Humber double steering. Bicycle patiern handles. Bicycle cranks, 5in. throw. Rubber pedals, plain. Central chain driving, and Humber double driving gear. Double lever band (5in. x lin.) brake. Humber spring. Long-distance saddle. Footrests on frame. Flat wrenches. Oilcan. Valise. Width 38 in ., reducible to 28 in . by Nottingham telescoping method. Weight 72lbs. The frame is like that of the Humber, described on page 200.

Specialties. Method of telescoping the frame (page 47). Humber double steering (page 63). Humber double driving (page 82).

$$
\text { Price .. .. .. .. } £ 24 \text { 0s. } 0 \text { d. }
$$

Sent out with plated and handle fittings, rest painted in two colours. Extras. Ball pedals, 20s.
Remarks. This is a beautifully built machine in every way, and is constructed on the well-known lines of the Humber, with the additional advantage of the increased facilities for stowage afforded by the telescopic arrangement.

## NOTTINGHAM ADJUSTABLE TELESCOPIC-D.D.

## Nottingham Tricycle Co., Hockley Mill Works, Nottingham.

Leading Features. Double front steering. Double driving with balance gear. Bicycle action. Adjustable for size. Telescopes for stowage.

Description. Two 44 in . and one 18in. wheel. Driving wheels 44 in ., running as 50 in . $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$ rubbers. Crescent rims. 50 and 24 , No. 11 direct spokes. G.M. hubs, 6 in. x $3 \frac{1}{2} \mathrm{in}$. Ball bearings to all wheels and cranks. Stanley rudder head. Humber double steering. Adjustable bicycle pattern handles. Bicycle cranks. Rubber pedals, plain. Central chain driving, and Humber double driving gear. Double lever band (5in. x lin.) brake. Adjustable seat rod. Scroll spring. Long-distance saddle. Footrests on frame. Flat wrenches. Oilcan. Valise. Width 38 in ., reducible to 28 in . by Nottingham telescopic method. Weight 74lbs. The frame is the same as the last, but the handles are made adjustable, and the seat also is placed on an adjustable rod.
Specialties. Nottingham telescopic action (page 47). Humber double steering (page 63). Humber double driving (page 82).
Price ... .. .. .. £24 0s. 0d.

Extras. Ball pedals, 20s.
Remarks. As fine a machine in every way as the other, with the advantage of adjustability, making the same machine do for different persons.

## OMNICYCLE-D.D.

Bicycle \& Tricycle Supply Assoctation, 27, Holborn Viaduct, London, E.C.


THE OMNICYCLE.
Leading Features. Front steering. Double driving with ratchet gear. Lever action. No dead points. Variable stroke.

Description. Two 50in. and one 18 in . wheel. Driving wheels $50 \mathrm{in} .$, running as 50 in ., 40 in ., and 30 in . $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 and 20 , No. 12 direct butt-ended spokes. Iron hubs, 5in. x 3 in. Ball bearings to all wheels. Stanley long centre rudder head. Rack and pinion steering. Adjustable spade handles. Non-slipping rubber pedals. Omnicycle lever and segmental driving gear, and ratchet double driving gear. Pull-up lever double band ( $4 \frac{1}{2} \mathrm{in} . \mathrm{x}_{8}^{5 \mathrm{in}}$.) brake. Adjustable seat rod. Arab Cradle spring. Suspension tricycle saddle. Pedals form footrests. Flat wrench. Oilcan. Width 40 in . Weight 951 lbs . T frame of weldless steel tube.

Specialties. Omnicycle levers (page 65). Omnicycle segmental driving gear (page 92).

$$
\text { Price .. .. .. .. £26 } 5 \mathrm{~s} . \quad 0 \mathrm{~d} .
$$

Sent out with plated hubs, gear and handle fittings, rest painted in two colours.
Remarks. This is a very powerful machine at hill work, and when built with large wheels is capable of very considerable speed. The action is pleasant and easy. The machiue is thoroughly well made and finely finished, and has been reduced in weight by noless than $401 b s$. for this season, as well as a simple arrangement added to allow the machine to be run back. The alteration of the gear is effected whilst running.

## OMNIMOTOR—D.D.

Broadbent Cycle Co., Hurley Road, Lower Kennington Lane, London, S.E.
Leading Features. Open front. Rear steering. Double driving, both backwards and forwards, with clutch action. Stationary pedals. Spring frame.

Description. Two 42in. and one 18in. wheel. Driving wheels 42 in ., running as $52 \mathrm{in} .{ }_{8}^{7} \mathrm{in}$. and ${ }_{8}^{5} \mathrm{in}$. rubbers. Crescent rims. 60 and 20 , No. 11 direct spokes. G.M. hubs, 5 in. x $4 \frac{1}{2}$ in. Ball bearings to all wheels, and plain to crank shaft. Stanley spring rudder head. Rack and pinion steering. Adjustable spade steering handle, and pear-shaped purchase handle. Doublecranked pedal shaft, 6 in. throw. Rubber pedals, plain. Double chain driving. and Broadbent patent double driving gear. Push lever double tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame, and pedals form footrests. Flat wrench. Oilcan. Valise. Width 34in., reducible to 28in. by taking off the loose wheel. Weight 89lbs. Hayfork frame.

Specialties. Spring steering head (addenda). Broadbent driving clutches. Price .. .. .. .. £16 16s. 0d.
Sent out with bright spokes and handle fittings, rest painted in two colours.
Remarks. .This machine combines botl forward and backward automatic double driving with free pedals, whilst the steering head is fitted with a spring on which the backbone end rests, to avoid the vibration arising from the small wheel. It has only just been introduced.

## ONWARD.

## Samuel Cotterill, Wolverhampton.

## Leading Features. Open front. Rear steering. Single driving.

Description. Two 44 in . and one 20 in . wheel. Driving wheel 44 in ., running level. ${ }_{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. Direct spokes. G.M. hubs. Coned bearings to steering wheel, plain to driver and crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pearshaped purchase handle. Double-cranked pedal slaft, 6in. throw. Rubber pedals, plain. Chain driving. Pull-up lever tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Width 39 in ., reducible to 33 in . by taking off the loose wheel. Weight 891bs. Hayfork frame.

$$
\begin{array}{llllll}
\text { PRICE } & \quad . & \quad . & . . & \text {.. } & \text { 0s. }
\end{array}
$$

Sent out with bright spokes and handle fittings, rest painted in two colours. Extras. Balls to large wheels, 20s.; to back wheel, 10s. ; to crank shaft, 10s. Remarks. A very low-priced machine.

ORBICYCLE-D.D.
Thomas Moore, Kennington Park Corner, London, S.E.


THE ORBICYCLE.
Leading Features. Front steering. Double driving with balance gear. Central gear. No chains or exposed gear wheels.

Description. Two 48 in . and one 18 in . wheel. Driving wheels, 48 in ., running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 50 and 24 , No. 13 direct spokes. G.M. hubs. Ball bearings to steering wheel, rollers to driving shaft, and balls to cranks. Stanley rudder head. Rack and pinion steering. Adjustable spade handles. Bicycle cranks. Rubber pedals, plain. Central Orbicycle wheel driving, and Starley's patent double driving gear. Push lever band ( $4 \frac{1}{2} \mathrm{in} . \mathrm{x}$ $\frac{3}{4}$ in.) brake. Adjustable $\Gamma$ seat rod. Elliptical spring. Pan seat. Spring footrests on frame. Adjustable wrench. Oilcan. Valise. Width 38in., reducible to 26 in . by taking off both large wheels. Weight 981 bs . T frame of weldless steel tube.

Specialties. Orbicycle driving gear (page 72).
Price .. .. .. .. £21 0s. 0d.
Sent out Fith plated hubs and handle fittings, rest painted in two colours.
Extras. Cradle spring, 10s.; ball pedals, 21s.; non-slipping tyres, 10s.; ratchet brake holder, 10s. 6 d . ; plated orbs, 40 s .

Remarks. This machine is very taking in appearance, and is soundly and thoroughly well made in every detail. To the uninitiated its action is quite mysterious, all the gearing being enclosed in the orbs and shut out from view, as well as kept clear of dust. By reversing the seat rod and using a saddle it can be ridden à la Humber, and made a back steerer of. (See ddvertisement.)

## ORBICYCLE HILL-CLIMBER-D.D.

Thos. Moore, Kennington Park Corner, London, S.E.
Leading Features. Front ste rring. Double driving with balance gear. Central gear. No chains or exposed gear wheels. Automatic hill gear. Free pedals.

Description. Two 48 in . and one 18 in . wheel. Driving wheels 48 in ., running as 48 in . and 32 in . ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{1} \mathrm{in}$. rubbers. Crescent rims. 50 and 24, No. 13 direct spokes. G M. hubs. Ball bearings to steering wheel, rollers to driving shaft, and balls to cranks. Stanley rudder head. Rack and pinion steering. Adjustable spade handles. Bicycle cranks. Rubber pedals, plain. Central Orbicycle driving gear, Orbicycle hill gear, and Starley's patent double driving gear. Push lever band ( $4 \frac{1}{2}$ in. $\times \frac{3}{4}$ in.) brake. Adjustable $\Gamma$ seat rod. Elliptical spring. Pan seat. Spring footrests on frame, and pedals form footrests. Adjustable wrench. Oilcan. Valise. Width 38in., reducible to 26 in . by taking off both large wheels. Weight 991bs. T frame of weldless steel tube.

Specialties. Orbicycle driving gear (page 72). Orbicycle hill gear (page 92).
Price .. .. ... .. £2t 0s. 0d.
Sent out with plated hubs and handle fittings, rest painted in two colours.
Extras. Cradle spring, 10s.; ball pedals, 21s.; non-slipping tyres, 10s.; ratchet brake holder, 10s. 6 d .; plated orbs, 40 s .
Remarks. This is identical with the last, with the addition of the Orbicycle hill-climbing gear, with which the rider only has to reverse the motion of his feet to put the power gear into action. It is a perfect double driver, and the feet may remain stationary on the pedals when descending , hills, but the machine cannot be driven backwards. (See Advertisement.)

## OUTRUNNER—D.D.

Bicycle and Tricycle Supply Co., 21, Princes Alley, Wolverhampton.
Leading Features. Open front. Rear steering. Double driving with two chains.
Description. Two 50in. and one 20in. wheel. Driving wheels 50in., running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. Direct spokes. G.M. hubs. Ball bearings to all wheels, and plain to crank shaft. Stanley rudder headRack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 6in. throw. Rubber pedals, plain. Chain driving, and ratchet double driving gear. Push lever band brake. Adjustable seat rod. Elliptical spring. Pan seat. Pedals form footrests. Flat wrench. Oilcan. Two lamps. Bell. Width 39in., reducible to 31in. by taking off the loose wheel. Weight 901 bs . Hayfork frame.

$$
\text { Price .. .. } \quad . \quad \text {. } \quad \text { £ } 15 \text { 0s. 0d. }
$$

Sent out with plated spokes and handle fittings, rest painted in two colours.

## PILOT No. 1-D.D.

Hickling \& Co., Queen Street, Maidenhead.
Leading Features. Open front. Rear steering. Double driving with two chains.

Description. Two 46 in . and one 22 in . wheel. Driving wheels $46 \mathrm{in} .$, running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 48 and 24 , No. 11 direct spokes. G.M. hubs, $5 \frac{1}{2} \mathrm{in} . \times 4 \frac{1}{2} \mathrm{in}$. Plain bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 6in. throw. Rubber pedals, plain. Double chain driving, and ratchet double driving gear. Pull-up lever double tyre brake. Adjustable 「 seat rod. Elliptical spring. Pan seat. Pedals form footrests. Adjustable wrench. Oilcan. Width 39in. Weight 85lbs. Havfork frame.

Specialties. Tyres wired in so as to render them almost impossible to be torn out.

$$
\begin{array}{lllllll}
\text { Price } & . & . . & . . & . . & £ 18 & 0 \mathrm{~s} .
\end{array}
$$

Sent out with plated fittings, rest painted in two colours.
Remarks. A sound, well-constructed, reliable machine.

## PILOT No. 2.

## Hickling \& Co., Queen Street, Maidenhead. <br> Leading Features. Open front. Rear steering. Single driving.

Description. Two 46 in . and one 22 in . wheel. Driving wheel 46 in ., running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 48 and 24 , No. 11 direct spokes. G.M. hubs, $5 \frac{1}{2} \mathrm{in} . \times 4 \frac{1}{2} \mathrm{in}$. Plain bearings to all wheels and crankshaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pearshaped purchase handle. Double-cranked pedal shaft, 6 in. throw. Rubber pedals, plain. Chain driving. Pull-up lever double tyre brake. Adjustable $\Gamma$ seat rod. Elliptical spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Width 39 in ., reducible to 32 in . by taking off the loose wheel. Weight 801 bs. Hayfork frame.

Specialties. Wired tyres.
Price .. .. .. .. £15 10s. 0d.

Sent out with plated fittings, rest painted in two cnlours.
Remarks. A strong, sound machine of the orlinary type, with a very good point in the security of the tyres.
PIONEER-D.D.
H. J. Pausey, Bedford Road, Clapham, London.


Leading Features. Front steering. Double driving with balance gear.
Description. Two 48 in . and one 18in. wheel. Driving wheels $48 \mathrm{in} .$, running level. ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. No. 11 direct spokes. G.M. hubs, 5in. $x 4 \frac{1}{2}$ in. Ball bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shaft, 6in. throw. Rat-trap pedals, plain. Chain driving, and Lewis's double driving gear. Push lever band brake. Adjustable seat rod. C spring. Longdistance saddle. Footrests on frame. Adjustable wrench. Oilcan. Valise. Width 4lin. Weight 85 lbs . Loop frame.

Specialties. Lewis's balance gear.
Price. .. .. .. .. £18 18s. 0d.
Sent out painted in two colours.
Remarks. This maker has always made sound and reliable bicycles, and this machine, which is new this season, seems likely to add to his reputation rather than otherwise. (See Advertisement.)

## PIONEER RACER-D.D.

I. J. Pausey, Bedford Road, Clapham, London, S.W.

Leading Features. Front steering. Double driving with balance gear.
Description. Two 46 in . and one 16 in . wheel. Driving wheels 46 in ., running as $57 \mathrm{in} .{ }_{8}^{5} \mathrm{in}$. and $\frac{1}{2} \mathrm{in}$. rubbers. Crescent rims. No. 12 direct spokes. G.M. hubs. Ball bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shaft, $5 \frac{1}{2} \mathrm{in}$. throw. Rat-trap pedals on ball bearings. Chain driving, and Lewis's double driving gear. Adjustable $\Gamma$ seat rod. Racing saddle. Flat wrench. Oilcan. Width 39in. Weight 58lbs. Loop.frame.

Specialties. Lewis's balance gear.

$$
\text { Price } \underset{\text { Sent out painted in two colours. }}{\ldots} \text {.. }
$$

Remarks. A light machine, built specially for racing purposes. (See Advertisement.)

## PREMIER-D.D.

Hillman, Herbert \& Cooper, Premier Works, Coventry.


THE PREMIER.
Leading Features. Front steering. Double driving with balance gear. High frame.

Description. Two 48 in . and one 17in. wheel. Driving wheels 48 in ., running level. $\frac{7}{8}$ in. and $\frac{3}{1} \mathrm{in}$. rubbers. Crescent rims. 60 and 20, No. 12 direct spokes. G.M. hubs. Hillman's ball bearings to driving and crank shafts. Stanley rudder head. Rack and pinion steering. Premier adjustable spade handles. Double-cranked pedal shaft, $5 \frac{3}{1}$ in. throw. Rubber pedals, plain. Chain driving, and Hillman's patent double driving gear. Push lever band (6in. x $\left.1 \frac{1}{4} i n.\right)$ brake. Adjustable $\Gamma$ seat rod, with fixed spanner. Premier elliptical spring. Pan seat. Footrests on frame. Flat wrenches. Oilcan. Width 41in. Weight 85lbs. The frame is a loop of lin. weldless steel tube, but has a shorter backbone to the front wheel than usual, which brings the fore part of the frame higher.

Specialties. High frame. Hillman's ball bearings (page 33). Hillman's balance gear (page 8t). Premier spring (page 49). Harrington's enamel (page 123). Premier adjustable handles (page 59).

$$
\text { Price .. } \quad . . \quad \therefore \quad \cdots \quad \text { £23 0s. 0d. }
$$

Sent out enamelled plain black in Harrington's enamel.
Extras. Ball bearings to front wheel, 20s.; ball pedals, 20s.; nickel-plating £6; Cradle spring, 10 s .; lining in colours, 10 s .

Remarks. This is a very finely built machine, vertically positioned and fitted with reliable brake and "all the latest improvements." It is one of the lightest roadsters of this class machine in the market, and runs easily and well. The tilt rod is at the side. It was on one of these machines that Mr. Nixon rode from John o' Groat's to Land's End last year in 14 days. (See Advertisement.)

## PREMIER RACER-D.D.

Hillman, Herbert \& Cooper, Premier Works, Coventry.

the premier racer.
Leading Features. Front steering. Double driving with balance gear.
Description. Two 48 in . and one 17 in . wheel. Driving wheels 48 in ., running as 58 in . $\frac{9}{16} \mathrm{in}$. and $\frac{1}{2} \mathrm{in}$. rubbers. Crescent rims. 60 and 20 , No. 13 direct spokes. Hollow hubs. Hillman's ball bearings to steering wheel, driving and crank shafts. Stanley rudder head. Rack and pinion steering. Premier adjustable spade handles. Double-cranked pedal shaft, 5 3in. throw. Rat-trap pedals on Hillman's ball bearings. Chain driving, and Hillman's patent double driving gear. Adjustable seat rod. Premier elliptical Duplex spring. Racing saddle. Flat wrench. Oilcan. Width 41in. Weight 54lbs. Loop frame, with high front.

Specialties. Hillman's double ball bearings (page 33). Premier adjustable handles (page 59). Premier Duplex spring (page 49). Hillman's patent balance gear (page 84). Harrington's enamel (page 123).

Sent out enamelled all over plain black in Harrington's enamel.
Remarks. This machine is specially built for racing, and I have found it run with remarkuble ease and freedom. (See Advertisement.)


THE PREMIER SOCIABLE.
Leading Features. Front steering. Double driving with balance gear. Righthand rider steers.

Description. Two 48in. and one 18in. wheel. Driving wheels 48in., running level. lin. and $\frac{7}{8} \mathrm{in}$. rubbers. Crescent rims. 74 and 24, No. 12 direct spokes. G.M. hubs. Ball bearings to all wheels and crank shafts. Stanley rudder head. Rack and pinion steering. Premier adjustable spade handles, and Premier steering. Double-cranked hollow pedal shafts, 6 in. throw. Rubber pedals, plain. Chain driving, and Hillman's patent double driving gear. Push lever band ( $6 \mathrm{in} . \times 1 \frac{1}{2} \mathrm{in}$.) brake. Adjustable $\Gamma$ seat rods, with fixed spanners. Premier Duplex spring. Pan seat, and Long-distance saddle. Footrests on frame. Flat wrench. Oilcan. Width 61in. Weight 145lbs. The frame is a double loop of steel tube.

Specialties. Hillman's double ball bearings (page 33). Premier steering (addenda). Hillman's balance gear (page 84). Premier Duplex spring (page 49). Harrington's enamel.
Price .. .. .. .. £30 0s. 0d.

Sent out enamelled plain black in Harrington's enamel.

## Extrass Ball pedals, 60s. ; all plated, £10; colours, 10s.

Remarks. This is a well designed sociable, having both the steering and the brake under the control of the rider on the right-hand side of the machine, thus placing the lady on the side of the machine farthest from danger in case of collision with horse traffic. It is sound and reliable, and as fine a double as one could wish. (See Advertisement.)

## PRINCESS.

Henry Patrick \& Co., 47 \& 48, Darlington Street, Wolverhampton.
Leading Features. Open front. Rear steering. Single driving.
Description. Two 44 in . and one 17 in . wheel. Driving wheel 44 in ., running as $50 \mathrm{in} .{ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 44 and 20, No. 11 direct spokes. Iron hubs, $5 \frac{1}{4} \mathrm{in} . \mathrm{x} 4 \mathrm{in}$. Plain bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 7in. throw. Rubber pedals, plain. Chain driving. Pull-up lever double tyre brake. Ad-
justable seat rod. Elliptical spring. Pan seat. Footrests on frame. Flat wrench. Oilcan. Lamps. Valise. Width 34in., reducible to 26 in . by taking off the loose wheel. Weight 85lbs. Hayfork frame.

Price .. .. .. .. $£ 14$ 10s. 0d.
Sent out painted in three colours.
Remarks. A plain ordinary machine.

## QUADRANT-D.D.

Lloyd Bros., Harborne, near Birmingham.


THE QUADRANT.
Leading Features. Open front. Rear steering. Double driving with two chains. Large steering wheel to avoid vibration.

Description. Two 46 in . and one 40 in . wheel. Driving wheels 46 in ., running level. $\frac{3}{4}$ in. rubbers. Crescent rims. 46 direct spokes. G.M. hubs, 6 in. x $3 \frac{1}{2} \mathrm{in}$. Roller bearings to all wheels and crank shaft. Rack and pinion Quadrant steering. Adjustable spade handles. Double-cranked pedal shaft, 6 in. throw. Rubber pedals, plain. Double chain driving, and clutch double driving gear. Twist lever Quadrant double band ( $3 \frac{1}{2} \mathrm{in} . \times \frac{3}{4} \mathrm{in}$.) brake. Adjustable $\Gamma$ seat rod. Arab Cradle spring. Suspension tricycle saddle with back. Lloyd's fontrests on frame, and pedals form footrests. Two flat wrenches. Oilcan. Valise. Bell. Two lamps. Width 39in. Weight 94lbs. The frame is of the hayfork type, of weldless steel tube, but with double backbone as described in noticing the Quarrant steering.

Specialties. Large back wheel. Quadrant steering (page 63). Lloyd's folding footrests for ladies (page 101). Lloyd's double band brake (page 98). Lloyd's driving clutches.
Price ... .. .. .. £20 0s. 0d.

Sent out with plated hubs and fittings, rest painted in two colours.
Remarks. This machine is built soundly and well, and brings a new principle into play, viz., the use of three wheels of nearly equal size, by which vibration is lessened in a considerable degree, the weight being borne equally by all three wheels. It also makes the steering steadier, and prevents tilting up of the back wheel, skidding, slipping, etc., whilst it allows of perfect verticality of position. A No. 2 is made which differs from the akove only in size of wheels, these being 40 in . and 34 in . respectively. (See Advertusement.)

## QUADRANT SOCIABLE.-D.D.

Lloyd Bros., Harborne, Near Birmingham.

Leading Features. Open front. Rear steering. Independent double driving with clutch gear.

Description. Two 46 in . and one 34 in . wheel. Driving wheels 40 in ., running level. $\frac{3}{4}$ in. rubbers. Crescent rims. 60 and 46 direct spokes. G.M. hubs, 6 in. x $3 \frac{1}{2}$ in. Roller bearings to all wheels and crank shaft. Rack and pinion Quadrant steering. Adjustable spade handles. Double-cranked pedal shafts, 6in. throw. Rubber pedals, plain. Double chain driving, and clutch double driving gear. Push lever double band ( $3 \frac{1}{2}$ in. $x \frac{3}{4}$ in.) brake. Adjustable $\Gamma$ seat rods. Arab Cradle springs. Pan seat. Suspension tricycle saddle. Lloyd's footrests on frame, and pedals form footrests. Two flat wrenches. Oilcan. Valise. Bell. Two lamps. Width 53in. Weight 1201bs. The frame is like that of the single machine, with a wider " body "to admit of two riders.

Specialties. Large back wheel. Lloyd's driving clutch. Quadrant steering (page 63). Lloyd's footrests for ladies (page 101). Quadrant double band brake (page 98).

$$
\text { Price } \quad . \quad . . \quad .9 \quad . . \quad . . . \quad £ 30 \quad 0 \mathrm{~s} . \quad 0 \mathrm{~d} .
$$

Sent out with plated hubs and fittings, rest painted in two colours.
Remarks. Vertical action and open front, with steady steering, make this a very pleasant and easy machine to ride. It is well built and reliable. (See Advertisement.)

## RAMBLER-D.D.

## Safety Cycle Co., St. Paul's Square, Bedford.

Leading Features. Front steering. Double driving with balance gear.
Description. Two 46 in . and one 17 in . wheel. Driving wheels 46 in ., running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 and 22 , No. 11 direct spokes. G.M. hubs, $5 \frac{1}{2} \mathrm{in} . \times 4 \frac{1}{2} \mathrm{in}$. Ball bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Aảjustable spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 5in. throw. Double rubber pedals, plain. Intermediate wheel driving, and Kirby's patent double driving gear. Push lever wire band (7in. $\mathrm{x} \frac{1}{4} \mathrm{in}$.) brake. Adjustable $\Gamma$ seat rod. Arab Cradle spring. Suspension saddle. Pedals form footrests. Flat adjustable wrench. Oilcan. Valise. Width 39in. Weight 85lbs. T frame, with side arms to carry the crank ends.

Specialties. Kirby's balance gear (page 84). Wire band brake. Frame.
Price .. .. .. .. £21 0s. 0d.

Sent out painted in two colours.
Remarks. This machine is soundly built, and of neat light form. It is also made as a folder, with telescopic axle, at an extra charge of 30s. (See Advertisement.)

## RAPID.

St. George's Foundry Co., Pope Street, Birmingham.


Leading Features. Open front. Rear steering. Single driving. Two speeds for hill work. Divisible for stowage. Left-hand steering.

Doscription. Two 40 in . and one 18in. wheel. Driving wheel 40 in , running as 48 in . and 34 in . $\frac{7}{8} \mathrm{in}$. and $\frac{1}{16} \mathrm{in}$. rubbers. Crescent rims. 44 and 18, No. 10 direct spokes. G.M. hubs, $5 \frac{1}{2} \mathrm{in}$. $\mathrm{x} 3 \frac{1}{4} \mathrm{in}$. Ball bearings to steering wheel, plain to driver, and ball to crank shaft. Socket rudder head. Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shaft, 6in. throw. Rubber pedals on coned bearings. Rapid hill-climbing driving gear. Pull-up Rapid self-adjusting double-tyre brake. Adjustable $\Gamma$ seat rod. Easy spring. Pan seat. Pedals form footrests. Adjustable wrench. Oilcan. Rapid lubricators. Width 37 in ., reducible to 20 in . by dividing the frame. Weight 991 lbs . Hayfork frame.

Specialties. Rapid hill-gear (page 88). Rapid divisible frame (page 43). Rapid lubricators (page 106). Rapid ball bearings (page 33). Rapid swivelling brake (page 96). Left-hand steering.

Price .. .. .. .. £17 17s. 0d.
Sent out with plated fittings, rest painted in two colours.
Remarks. This machine has many peculiarities which will prove recommendations according to individual tastes and circumstances. It is easily passed through an ordinary doorway, and the hill-climbing gear is simple and easily put in action, whilst the left-hand steering is another peculiarity. It is well and strongly built, aud reliable. (See Advertisement.)

## ROBERT BURNS.

Samuel Lloyd, Church Lane, Wolverhampton.

## Leading Features. Open front. Rear steering. Single driving

Description. Two 44 in . and one 20 in . wheel. Driving wheel 44 in ., running level. $\frac{7}{8}$ in. and $\frac{3}{4}$ in. rubbers. Crescent rims. Direct spokes. G.M. hubs. Coned bearings to steering wheel, plain to driver and crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pearshaped purchase handle. Double-cranked pedal shaft, 6in. throw. Rubber pedals, plain. Chain driving. Pull-up lever double tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Width 39in., reducible to 33in. by taking off the loose wheel. Weight 82lbs. Hayfork frame.

> Price .. .. .. .. £12 0s. 0d.

Sent out painted in two colours.
Extras. Ball bearings, 4 n .
Remarks. A low-priced machine of the common rear steering type.

## ROYAL-D.D.

## Hillian, Herbert \& Cooper, Premier Works, Coventry.

Leading Features. Front steering. Double driving with balance gear.
Description. Two 50in. and one 17 in . wheel. Driving wheels $50 \mathrm{in} .$, running level. ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 and 20, No. 12 direct spokes. Plain bearings throughout. Stanley rudder head. Rack and pinion steering. Premier adjustable spade handles. Double-cranked pedal shaft, $5_{4}^{3}$ ia. throw. Rubber pedals. Chain driving, and Starley's patent double driving gear. Push lever band (7in. x ${ }_{4}^{3} \mathrm{in}$.) brake. Adjustable $\Gamma$ seat rod. Premier elliptical spring. Pan seat. Footrests on frame. Flat wrench. Oilcan. Width 41 in. Weight 951 bs . The frame is a square cornered loop of weldless steel tube.

Specialties. Starley's balance gear (page 80). Premier Duplex spring (page 49). Harrington's enamel.
Price .. .. .. .. £20 0s. 0d.

Sent out with plated handle fittings, rest enamelled plain black in Harrington's enamel.


THE ROYAL.
Extras. Ball bearings to front wheel, 20s.; ball pedals, 20s.; Cradle spring, 10 s . ; lining in colours, 10 s . ; in gold, 20 s .

Remarks. A first-class machine in every way, utilising Starley's gear by special licence. (See Advertisement.)

## ROYAL MAIL No. 1-D.D.

Royal Machine Manufacturing Co., Small Heath, Birmingham.
Leading Features. Front steering. Double driving with balance gear.
Description. Two 48 in . and one 18 in . wheel. Driving wheels 48 in ., running level. $7_{8}^{2} \mathrm{in}$. and $\frac{3}{3} \mathrm{in}$. rubbers. Crescent rims. 60 and 24 , No. $11 \frac{1}{2}$ direct spokes. Steel hubs. Ball bearings to steering wheel, rollers to drivers, and Universal jointed plain to crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade steering handle, and pear-shaped purchase handle. Doublecranked pedal shaft, 6 in . throw. Rubber four-bar pedals, plain. Chain driving, and Starley's patent double driving gear. Push lever band (7in. x lin.) brake. Adjustable $\Gamma$ seat rod. Arab Cradle spring. Pan seat. Footrests on frame. Two flat wrenches. Oilcan. Width 38 in . Weight 95lbs. Loop frame of weldless steel tube, with central tilt rod.

Specialties. Starley's balance gear (page 80).

$$
\begin{aligned}
& \text { Price } \underset{\text { Sent out japanned in two colours. }}{\ldots} \text { 0d. } \\
& \hline
\end{aligned}
$$

Remarks. This is a thoroughly well-constructed machine, made with the best machinery throughout, and of the best material. Has vertical action and Starley's gear.

## ROYAL MAIL No. 2.

Royal Machine Manufacturing Co., Herbert Road, Small Heath, Birmingham.
Leading Features. Open front. Rear steering. Single driving.
Description. Two 42 in . and one 18 sin . wheel. Driving wheel 42 in ., running as 50 in . ${ }_{8}^{7 i n}$. and 3 in . rubbers. Crescent rims. 60 and 24 , No. $11 \frac{1}{2}$ direct spokes. G.M. hubs. Ball bearings to all wheels, and plain to crank shaft.

Stanley rudder head. Rack and pinion steering. Adjustable spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 6 in . throw. Rubber pedals, plain. Chain driving. Pull-up lever double tyre brake. Adjustable $\Gamma$ seat rod. Arab Cradle spring. Suspension tricycle saddle. Footrests on frame. Two flat wrenches. Oilcan. Width 37 in ., reducible to 33in. by taking off the loose wheel. Weight 80lbs. Hayfork frame, with rudder wheel well back.

the royal mail no. 2.
Price .. .. .. .. £17 17s. 0d.
Sent out japanned in two colours.
Extras. Part plated, 40s. ; half plated, £4; all plated, £8.
Remarks. A sound, genuine, well built and nicely finished machine of the rear steering type, with the steering wheel well behind for greater steadiness.

## ROYAL MAIL No. 3-D.D. <br> Royal Machine Manufacturing Co., Herbert Road, Small Heath, Birmingham.

Leading Features. Open front. Rear steering. Double driving with balance gear.

Description. Two 46 in . and one 18 in . wheel. Driving wheels 46 in., running level. ${ }_{8}^{7}$ in. and $\frac{3}{1} \mathrm{in}$. rubbers. Crescent rims. 60 and $24, \mathrm{~N}$ o. $11 \frac{1}{2}$ direct spokes. G.M. hubs. Ball bearings to all wheels, and to crank slaft. Stanley rudder head. Rack and pinion steering. Adjustable spade steering handle, and pearshaped purchase handle. Double cranked pedal shaft, 6in. throw. Rubber pedals, plain. Chain driving, and Starley's patent double driving gear. Pullup lever band brake. Adjustable $\Gamma$ seat rod. Arab Cradle spring. Suspension saddle. Footrests on frame. Two flat wrenches. Oilcan. Width 38in. Weight $901 b s$. Hayfork frame.

Specialties. Arrangement of balance gear to a rear steerer (page 85).
Price .. .. .. .. £22 0s. 0d.
Sent out japanned in two colours.
Remarks. This is the same in build and general quality as the last, but by the addition of an extra gear shaft, and Starleys balance gear, is made a perfect double driver whilst keeping its open front.


#### Abstract

ROYAL MAIL No. 4-D.D. Royal Machine Manufacturina Co., Small Heath, Birmingham. Leading Features. Front steering. Open front. Two tracks. Double driving with balance gear.

Description. Two 48 in . and one 20 in . wheel. Driving wheels 48 in ., running level. ${ }_{\frac{7}{8}}^{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 and 24 , No. $11 \frac{1}{2}$ direct spokes. Steel hubs, $5 \mathrm{in} . \mathrm{x} 3 \frac{1}{2} \mathrm{in}$. Ball bearings to steering wheel, roller to drivers, and plain to crank shaft. Stanley rudder head. Rack and piniou steering. Adjustable spade steering handle, and pear-shaped purcbase handle. Double-cranked pedal shaft, 6 in. throw. Rubber pedals, plain. Chain driving, and Starley's patent double driving gear. Push lever band (7in. x lin.) brake. Adjustable 「 seat rod. Arab Cradle spring. Long-distance saddle. Footrests on frame. Two flat wrenches. Oilcan. Width 38 in . Weight 85 lbs . The frame is of $\Gamma$ shape, a tube running out on one side and carrying the steering wheel just in front of one of the drivers.


Specialties. Starley's balance gear (page 80). Frame. Two tracks.

$$
\text { Price } \underset{\text { Sent out japanned in two colours. }}{ }
$$

Remarks. This machine is a two track double driver, and likely to take well. It is well made throughout, by no means heavy, and runs steadily both up and Jown hill.

## ROYAL MAIL SOCIABLE No. 1-D.D.

Royal Machine Manufacturing Co., Herbert Road, Small Heath, BirminghamLeading Features. Open front. Rear steering. Independent double driving. Description. Two 42 in . and one 20 in . wheel. Driving wheels 42 in ., running level. 1in. and $\frac{7}{8} \mathrm{in}$. rubbers. Crescent rims. 50 and 20 direct spokes. G.M. hubs, 6in. x 4in. Ball bearings to all wheels. Stanley rudder head. Rack and pinion steering. Adjustable spade handles, and pear-shaped purchase handle. Double-cranked pedal shafts, running in plain bearings. Rubber pedals, plain. Double chain driving. Double tyre brake, with three lever handles. Adjustable seat rods. Elliptical springs. Saddle and seat. Footrests on frame. Wrench. Oilcan. Weight 145 lbs . The frame is a tubular double hayfork.

Price .. .. .. .. £26 0s. 0d. Sent out japanned in two colours.
Extras. Third seat, £2.
Remarks. This is well made, and a third seat is fitted sideways behind the other two, for a third non-working person, if desired, at an extra charge of $£ 2$.

## ROYAL ROB ROY.

## Zephyr Bicycle \& Tricycle Co., Lower Ford Street, Coventry.

Leading Features. Open front. Rear steering. Single driving. No chains.
Description. Two 30 in . and one 20 in . wheel. Driving wheel 30 in ., running as 46 in . ${ }^{5} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 30 No. 8 , and 20 No. 10 direct spokes. G.M. hubs, 6 in. x 4in. Ball bearings to steering and carrying wheels, plain to driver and crank shaft. Socket rudder head. Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shaft, 6in. throw. Rubber pedals, plain. Aviss's patent driving gear. Rob Roy ratchet double tyre brake. Adjustable 「 seat rod. Arab Cradle spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Width 37in. Weight 83lbs. Hayfork frame of weldless steel tube.

Specialties. Rob Roy ratchet brake (page 99). Aviss's patent driving gear (page 71).

$$
\text { Price .. .. .. .. } £ 18 \text { 10s. 0d. }
$$

Sent out with bright hubs, spokes and handle fittings, rest painted in two colours.

Remarks. This is a well-built, substantial and reliable machine, illustratigg in the highest degree the principle of gearing-up with small wheels. The whole
body is remarkably free, being placed clear above all wheels. One of these machines was supplied last year to H.R.H. the Prince of Wales. (SeeAdvertisement.)


THE ROYAL ROB ROY.


## ROYAL SALVO-D.D.

## Starley Bros., St. John's Works, Fleet Street, Coventry.

Leading Features. Front steering. Double driving with balance gear.
Description. Two 50 in . and one 16 in . wheel. Driving wheels 50 in , running as 46 in . ${ }_{8} \mathrm{in}$. rubbers. Crescent rims. 54 and 16 , Nu. 10 direct spokes. Steel hubs, $7 \mathrm{in} . \mathrm{x} 4 \mathrm{in}$. Roller bearings to drivers, and balls to steering wheel. Socket rudder head. Rack and pinion steering. Spade handle. Pear-shaped purchase handle. Double-cranked pedal shaft, running in plain beariugs. Rubber pedals, on plain bearings. Chain driving, and Starley's patent double driving gear. Lever band brake. Adjustable seat rod. Scroll spring. Cushioned seat. Fontrests on frame. Wrench. Oilcan. Spring top lubricators. Weight 1101 bs . Width $37 \frac{1}{2} \mathrm{in}$. The front is a loop, with flat steel sides.

Specialties. Starley's patent double driving gear ( page 80). Price .. .. .. .. £20 0s. 0d.

Sent out painted all over in two colours.
Remarks. This is the well-known production of the late Mr. James Starley, "the father of the tricycle," and the firm are now licensing several other makers to use the Salvo gearing. It was the first balance-geared double driver, and is strong and soundly made, and fit for all sorts of heavy rough work. This was the first tricycle ever supplied to Royalty, and the only one ever supplied to the Queen. (See Adrertisement.)

ROYAL SALVO No. 2-D.D.

the royal salvo no. 2.
Starley Bros., St. John's Works, Fleet Street, Coventry.
Leading Features. Front steering. Doubls ditiving with balance gear. Tubular frame.

Description. Two 46 in . and one 18 in . wheel. Driving wheels 46 in ., running level. ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. Hancock's combination rubbers. Crescent rims. 54 and 16, No. 12 direct butt-ended spokes. G.M. hubs, $7 \mathrm{in} . \mathrm{x} 4 \mathrm{in}$. Ball bearings to steering wheel, rollers to drivers, and plain to crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shaft, $5 \frac{1}{2}$ in. throw. Rubber pedals, plain. Chain driving, and Starley's patent double driving gear. Push lever band (6in. x lin.) brake. Adjustable $\Gamma$ seat rod. Special Salvo spring. Pan seat. Rubber footrests on frame. Flat wrench. Oilcan. Width 40in. Weight 85lbs. Loop frame of weldless steel tube, with tilt rod at side.
Specialties. Starley's balance gear (page 80).

$$
\begin{array}{lllllll}
\text { Price } & \text {.. .. .. }
\end{array}
$$

Sent out with bright handle fittings, rest painted in two colours.

Extras. Plated fittings, 20s.; Suspension saddle, 12s. ; Cradle spring, 17s.
Remaris. This is a new introduction for this season, and is fully up to the times. The position is vertical, the safety rod at the side, the brake lever long and powerful; all parts adjustable, and the whole light and stiff. (See Advertisement.)

## ROYAL WINDSOR-D.D.

Thomas Timberlake \& Co., 39, King Street, Maidenhead, Berks.
Leading Features. Front steering. Double driving with balance gear.
Description. Two 50 in . and one 20in. wheel. Driving wheels 50 in ., running level. $\quad \frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 and 24 , No. 12 direct spokes. G.M. hubs, 7in. x 4in. Æolus ball bearings to steering wheels, plain to drivers and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade steering handle, and pear-shaped purchase handle. Double-cranked pedal 'shaft, 6in. throw. Rubber pedals, plain. Chain driving, and Timberlake's double driving gear. Push lever band (Sin. x $1 \frac{1}{4}$ in.) brake and holder. Adjustable seat rod. S spring. Pan seat. Footrests on frame. Adjustable wrench. 广, Oilcan. Width 39in. Weight 98lbs. Loop frame.

Specialties. Wired tyres. Timberlake brake holder (page 100). Timberlake's balance gear.
Price .. .. .. .. £20 0s. 0d.

Sent out with bright spokes and handle fittings, rest painted in two colours.
Extras. Plated bright parts, 40s. ; all plated, $£ 6$.
Remarks. A good machine. Made to order only.

## RUCKER-D.D.

M. D. Rucker, Junr., \& Co., Letchford's Buildings, Bethnal Green, London.


THE RUCKER.
Leading Features. Open front. Rear steering. Double driving with two chains. Steering with either hand.

Description. Two 46 in . and one 20 in . wheel. Driving wheels 46 in ., running level. ${ }_{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 54 and 24 , No. 11 direct spokes. G.M. hubs, 6 in. x 4 in. Plain bearings to drivers, and balls to steering wheel. Stanley rudder head. Double rack and pinion steering. Adjustable spade handles. Double-cranked pedal shaft, running in ball bearings. Rubber pedals. Double chain driving, and Rucker double driving gear. Lever double band brake. Adjustable $\Gamma$ seat rod. Cradle spring. Suspension saddle. Wrench.

Oilcan. Weight 90lbs. Width 38in. The frame is a hayfork, with vertical forks and long backbone.

Specialties. Double steering. Rucker double driving gear (page 75).
Price .. .. .. .. £18 18s. 0d.

Sent out painted all over in two colours.
Remarks. The rider is placed well over his work, and can climb hills with facility. He can steer with either hand. The pedals form footrests for descending hills. The mashine is thoroughly well made, and can be relied on, whilst it is better positioned than any other in the market of this class. (See Advertisement.)

## RUCKER FRONT STEERER-D.D.

M. D. Rucker, Junr., \& Co., Letchford's Buildings, Bethnal Green, London.


THE RUCKER FRONT STEERER.
Leading Features. Front steering. Double driving with balance gear.
Description. Two 48in. and one 20in. wheel. Driving wheels 48 in ., running level. ${ }_{8}$ in. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 and 24, No. 12 direct spokes. G.M. hubs, 6 in . x $3 \frac{1}{2} \mathrm{in}$. Ball bearings to all wheels and crank shaft. Swindley's patent head. Rack and pinion steering. Adjustable spade handles. Doublecranked pedal shaft, 6 in. throw. Rubber pedals, plain. Chain driving, and Starley's patent double driving gear. Push lever band (6in. x lin.) brake. Adjustable 「 seat rod. Arab Cradle spring. Long-distance saddle. Rubber footrests, on frame. Flat adjustable wrench. Oilcan. Valise. Width 39in. Weight 85 lbs . Loop frame of weldless steel tube.

Specialties. Swindley's patent head. Starley's balance gear (page 80). Harrington's enamel (page 123). Britain's hill gear-extra (page 91).

$$
\text { Price .. .. .. .. } £ 22 \text { 0s. 0d. }
$$

Sent out enamelled all over plain black in Harrington's enamel.

## Extras. Britain's hill gear,

Remarks. This is fully vertically built, constructed with care and attention of the best materials, and can be relied on as a strong and trustworthy roadster. (See Advertisement.)

## RUCKER SOCIABLE-D.D.

## M. D. Rucker, Junr. \& Co., Letchford's Buildings, Bethnal Green, London.

Leading Features. Front steering. Double driving with balance gear. Open fronts and large rudder.
Description. Two 46 in . and one 24 in . wheel. Driving wheels 46 in ., running level. lin. rubbers. Crescent rims. 50 No. 9, and 24 No. 10 direct spokes. G.M. hubs, 6 in. $\times 5 \frac{1}{2} \mathrm{in}$. Ball bearings to all wheels and crank shafts. Swindley's patent rudder head. Special steering. Adjustable spade handles. Double-cranked pedal shafts, 6 in . throw. Rubber pedals, plain. Chain driving, and Starley's patent double driving gear. Push lever band (6in. x lin.) brake. Adjustable
$\Gamma$ seat rods. Arab Cradle springs. Pan seat and Long-distance saddle. Footrests or frame. Flat adjustable wrench. Oilcan. Valise. Width 60in. Weight 145lbs. T frame with long " bowsprit."

Specialties. Rucker special steering (addenda). Swindley's patent head. Starley's balance gear (page 80). Harrington's enamel (page 123).

$$
\begin{array}{llllll}
\text { Price }^{\text {.. .. .. .. }} \text {. } 29 & \text { 0s. } 0 \mathrm{~d} .
\end{array}
$$

Sent out enamelled all over in Harrington's enamel.
Remarks. This is a first-class machine, though but recently introduced. It is strong and well built, and designed with a view to steadiness and firmness in running, the rudder wheel being large and carried out well in front. (See Advertisement.)

RUDGE-D.D.

## D. Rudge \& Co., Crow Lane, Coventry.



THE'RUDCE' DCUBLE DRIVES.
Leading Features. Front steering. Double driving with balance gear.
Description. Two 48 in . and one 18 in . wheel. Driving wheels 48 in ., running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 70 and 24 , No. 11 direct spokes. G.M. hubs, $5 \frac{1}{2} \mathrm{in} . \mathrm{x} 4 \mathrm{in}$. Ball bearings to steering wheel, plain to drivers and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 6 in. throw. Rubber pedals, plain. Chain driving, and Starley's patent double driving gear. Push lever band (6in. x ${ }_{8}^{7} \mathrm{in}$.) brake. Adjustable $\Gamma$ seat rod. Arab Cradle spring. Long-distance saddle. Footrests on frame. Flat wrench. Oilcan. Width 39in. Weight 85lbs. Loop frame of weldless steel tube.

Specialties. Rudge's ball bearings (page 35). Starley's balance gear (page 80). Harrington's enamel.
Price .. .. .. .. £20 10s. 0d.

Sent out with bright spokes and handle fittings, rest painted in two colours.
Extras. Harrington's enamel, 10s.
Remarks. A finely finished, well built machine of the front steering class. Properly positioned and easy going. (See Advertisement.)

## SALVO SOCIABLE-D.D.

Starley Bros., St. John's Works, Fleet Street, Coventry.


THE SALVO SOCIABLE.
Leading Features. Front steering. Double driving with balance gear.
Description. Two 46 in . and one 20 in . wheel. Driving wheels 46 in ., running as 42 in . lin. rubbers. Crescent rims. 54 No. 8, and 20 No. 10 direct spokes. Iron hubs, $7 \mathrm{in} . \mathrm{x} 4 \mathrm{in}$. Ball bearings to steering wheel, rollers to drivers, and plain to crank shaft. Socket rudder head. Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shafts, $5 \frac{1}{2}$ in. throw. Rubber pedals, plain. Chain driving, and Starley's patent double driving gear. Push lever band ( $7 \mathrm{in} . \times 1 \frac{3}{4} \mathrm{in}$.) brake. Adjustable $\Gamma$ seat rods. Special Salvo springs. Pan seats. Rubber footrests on frame. Adjustable wrench. Oilcan. Width 60 in . Weight 145lbs. The frame, which is mainly of weldless steel tube, is a combination of the $T$ and the loop patterns. The lower portion is a double loop, whilst the upper portion is a $T$, the long forearm of which is supported by an upright on the fore part of the other part.

Specialties. Special Salwo springs (page 49). Starley's balance gear (page 80). Price .. .. .. .. .. .. £27 0s. 0d.

## Sent out painted in two colours.

Extras. Plated fittings, 25 s . ; plated wheels, 35 s .
Remarks. This is one of the finest sociables in the market in its new form, which is a vast improvement on the old. It is strong, reliable, safe and easy running, and admirably adapted for use as a "Club, 'Bus." (See Advertisement.)

## SANDRINGHAM.

J. Cox \& Son, Railway Road, King's Lynn.

Leading Features. Open front. Rear steering. Single driving.
Description. Two 44in. and one 20 in . wheel. Driving wheel 44in., running
level. ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 48 No. 11 , and 24 No. 12 direct spokes. G.M. hubs, $5 \frac{1}{2} \mathrm{in} . \mathrm{x} 5 \mathrm{in}$. Coned bearings to steering wheel, plain to driver and crank shaft. Stanley rudder head. Rack and pinion steering. Spade handles. Double-cranked pedal shaft, 5in. throw. Rubber pedals, plain. Chain driving. Twist lever double tyre brake. Adjustable seat rod. Elliptical spring. Woolley's saddle. Footrests on frame. Adjustable wrench. Oilcan. Valise. Lamp. Width 36 in ., reducible to 29 in . by taking off the loose wheel. Weight 801 lbs . Hayfork frame of $1 \frac{3}{8} \mathrm{in} .14$ w.g. steel tube.
Price .. .. .. .. £15 0s. 0d.

Sent out with bright spokes and plated handle fittings, rest painted in two colours.

Remarks. A strong neat machine, of the rear steering type.

## SEED.

Sambel Seed \& Son, High Street, Railway Road, Blackburn.
Leading Features. Open front. Rear steering. Single driving.
Description. Two 46in. and one 20in. wheel. Driving wheel 46in., running as $52 \mathrm{in} .{ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 and 20 , No. 11 direct spokes. G.M. hubs, 6in. x 5in. Coned bearings to steering wheel, plain to driver and crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, $5 \frac{1}{2} \mathrm{in}$. throw. Rubber pedals, plain. Chain driving. Double tyre brake. Adjustable $\Gamma$ seat rod. Elliptical spring. Pan seat. Footrests on frame. Flat wrench. Oilcan. Valise. Width 39in., reducible to 30in. by taking off the loose wheel. Weight 861bs. Hayfork frame.

$$
\text { Price .. .. .. .. } £ 14 \text { 0s. 0d. }
$$

Sent out painted in two colours.
Remarks. A strong, sound machine of the usual type, at a reasonable figure.

## SOCIABLE TRIUMPH-D.D.

Wariman, Lixon \& Youett, West Orchard, Coventry.



THE SOCIABLE TRIUMPH.

Leading Features. Open front. Rear steering. Independent double driving.
Description. Two 40 in . and one 20 in . wheel. Driving wheels 40 in ., running level. lin. and $\frac{7}{8} \mathrm{in}$. rubbers. Crescent rims. Direct spokes. Coned bearings to steering wheel, plain to drivers and crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, $5 \frac{1}{2}$ in. throw. Warman's rubber pedals, plain. Warman's patent chain driving. Push lever double tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Width 59in. Weight 140lbs. The frame is a double hayfork.

Specialties. Warman's patent driving chains (page 69).
Price .. .. .. .. £21 0s. 0d.

## Sent out painted in two colours.

Remarks. A strongly built open fronted sociable.

## SPARKBROOK NATIONAL-D.D.

Sparkbrook Manufacturivg Co. Ld., Much Park Street, Coventry.


THE SPARKBROOK NATIONAL.
Leading Features. Front steering. Double driving with balance gear. Machine built.

Description. Two 50 in . and one 17 in . wheel. Driving wheels $50 \mathrm{in} .$, running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. 60 No. 11, and 20 No. 12 direct steel spokes. Crescent rims. G.II. hubs, $6 \frac{1}{4} \mathrm{in}$. x $3 \frac{1}{2} \mathrm{in}$. Æolus ball bearings to all wheels, plain universal jointed bearings to crank shaft. Rack and pinion steering. Stanley head. Adjustable spade handles. Double-cranked pedal shaft, $5 \frac{1}{2} \mathrm{in}$. throw. Four bar, non-slipping rubber pedals on ball bearings. Chain driving, and National differential double driving gear. Lever (or grip at option) band ( $4 \frac{1}{2} \mathrm{in} . \times 1 \frac{1}{8} \mathrm{in}$.) brake. Adjustable $\Gamma$ seat rod. Cradle spring. Long distance saddle. Rubber hinged footrests. Flat wrenches. Oilcan. Width 38in. Weight 90lbs. Loop frame of weldless steel tube, the sides falling over rearwards to form tilt rods.

Specialties. Universal joints to bearings. National differential gear (page 84). Harrington's enamel (page 123). Machine construction.
Price .. .. .. .. £23 0s. 0d.

Sent out with polished fittings, rest enamelled plain black in Harrington's enamel.

Remarks. The Sparkbrook Manufacturing Co. have purchased the plant, tools, and machinery of the tricycle branch of the National Arms and Ammunition Co., of Sparkbrook, Birmingham, and have engaged the same men to manufacture the machine, so that it can be depended on for equality with that of last year. The chain is inside the frame, hence less strain, and the bearings can be placed at will either above or below the frame so as to make the position more or less vertical at will. The new firm are now fully in working order, and the machines are A1 in every way. (See Advertisement.)

SPECIAL CENTAUR-D.D.
Centaur Cycle Co., West Orchard Mills, Coventry.


THE SPECTAL CENTAUR.
Leading Features. Front steering. Double driving with balance gear.
Description. Two 48 in . and one 20 in . wheel. Driving wheels 48 in ., running as 42 in . $\frac{1}{1} \frac{1}{6} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 56 and 24 , No. 11 direct butt-ended spokes. Iron hubs, 6in. x 4 in . Ball bearings to all wheels, and plain to crank shaft. Socket rudder head. Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shaft, 6in. throw. Rubber pedals, plain. Chain driving, and Townsend's patent double driving gear. Push lever band ( $6 \mathrm{in} . \times \frac{3}{4} \mathrm{in}$. ) brake. Adjustable $\Gamma$ seat rod. Elliptical spring. Pan seat. Footrests on frame. Two flat wrenches. Oilcan. Width 40 in.

Weight $901 b s$. The frame is of weldless steel tube. It is of the loop variety, the sides being of $S$ shape, which allow of either vertical or thrusting action at will, without affecting the balance or requiring a tilt rod.
Specialties. Frame. Townsend's balance gear.

$$
\text { Price .. .. .. .. } 21 \text { 10s. 0d. }
$$

Sent out with plated fittings, rest painted in two colours.
Remarks. A sound, strongly-built handsome machine; has been much improved this season in a more vertical and lighter build. (See Advertisement.)

## SPECIAL NORTHAMPTON.

## E. Gadsby, Bearward Street, Northampton.

Leading Features. Open front. Rear steering. Single driving.
Description. Two 44in. and one 20in. wheel. Driving wheel 44in., running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 44 and 20, No. 11 direct spokes. G.M. hubs, 6 in. x 4 in . Ball bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pearshaped purchase handle. Double-cranked pedal shaft, 6 in . throw. Rubber pedals on ball bearings. Chain driving. Double friction brake. Adjustable $\Gamma$ seat rod. Improved C spring. Suspension saddle, with back. Footrests on frame. Flat wrench. Oilcan. Width 40 in ., reducible to 32 in . by taking off the loose wheel. Weight 85lbs. Hayfork frame.

Specialties. Double friction brake (addenda).
Price .. .. .. .. £16 0s. 0d. Sent out japanned and lined in gold.
Remarks. This is a soundly built and reliable machine, with an excellent and peculiar brake. It contains sound materials and gool work. (See Advertisement.)

## SPECIAL SEED.

Samuel Seed \& Son, High Street, Railway Road, Blackburn.

## Leading Features. Open front. Rear steering. Single driving.

Description. Two 46 in . and one 20 in . wheel. Driving wheel 46 in ., running as 52 in . $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 52 and 20, No. 11 direct spokes. Steel hubs, $6 \frac{1}{2} \mathrm{in} . x 4 \frac{1}{2} \mathrm{in}$. Ball bearings to all wheels, and plain to crank shaft. Ntanley rudder head. Rack and pinion steering. Adjustable spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, $5 \frac{1}{2}$ in. throw. Rubber pedals, plain. Chain driving. Pull-up lever double tyre brake. Adjustable 「 seat rod. Elliptical spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Lamps. Bell. Width 39in., reducible to 30in. by taking off the loose wheel. Weight 82 lbs . Hayfork frame.

> Price .. .. .. .. £16 16s. 0d.

Sent out with plated spokes and handle fittings, rest painted in two colours.
Remarks. A soundly constructed machine. Specially built for finish and ease of running.

## SPECIAL TIMBERLAKE.

## Thos. Thiberlake \& Co., 39, King Street, Maidenhead, Berks.

 Leading Features. Open front. Rear steering. Single driving.Description. Two 44in. and one 18in. wheel. Driving wheel 44in., running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4}$ in. rubbers. Crescent rims. 48 No. 11, and 24 No. 12 direct spokes. G.M. hubs, $6 \frac{1}{2}$ in. $x$ 4in. Ball bearings to steering wheel, plain to driver and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade steering handle, and pear-shaped purchase handle. Doublecranked pedal shaft, 6in. throw. Rubber pedals, plain. Warman's patent chain driving. Push lever double tyre brake, and holder. Adjustable seat rod. S spring. Suspension saddle. Footrests on frame. Adjustable wrench.

Oilcan. . Width 37in., redncible to 30 in . by taking off the loose wherl. Weight 781 bs . Hayfork frame of 1 B in . tube.


THE SPECLAL TMMBERLAKE.
Specialties. Timberlake brake holder (page 100). Wired tyres.

$$
\text { Price .. .. .. .. } \begin{array}{lllll} 
& 10 \mathrm{~s} . & 0 \mathrm{~d} .
\end{array}
$$

Sent out.with briyht spokes and handle fittings, rest painted in two colours.
Extras. Plated bright parts, 40s.; all plated £5; balls to large wheels, 355s.
Remarks. Built with fair verticality. A sound and genuine article, with an excellent brake. May be trusted for work.

## SPECIAL ZEPHYR.

## Zephyr Bicycle and Tricycle Co., Lower Ford Street, Coventry.

L॰ading Features. Open front. Rear stearing. Single driving. No chains or cog wheels.

Description. Two 46 in . and one 20 in . wheel. Driving wheel 46 in ., running level. ${ }_{8} \mathrm{in}$. and $\frac{3}{5} \mathrm{in}$. rubbers. Crescent rims. 40 and 20 , No. 10 direct spokes. G.M. hubs, 6 in. x 4 in. Ball bearings to steering and carrying wheels, plain to driver and crank shaft. Socket rudder head. Rack and pinion steering. Adjustrble spade handles. Double-cranked pedal shaft, 6in. throw. Rubber pedals, plain. Special Zephyr driving gear. Push lever double tyre brake, with holder. Adjustable seat rod. Arab Cradle spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Width 41in. Weight 83lbs. Hayfork frame.

Specialties. Special Zephyr driving gear (page 73). Rob Roy ratchet brake (pagc 99).
Price .. .. .. .. .. £20 0s. 0d.

Sent out with bright spokes and handle fittings, rest painted in two colours.
Remarks. A strong and reliable machine. The driving action is effective and pretty, and the machine of the best quality in every respect. (See Advertisement.)


THE SPECIAL ZEPHYR.

## SPEEDWELL.

## John Bullock \& Co., Speedwell Works, 280, Broad Street, Birmingham.

Leading Features. Open front. Rear steering. Single driving.
Description. Two 42 in . and one 18 in . wheel. Driving wheel 42 in ., running level. $\frac{3}{4}$ in. rubbers. Crescent rims. 50 and 26, No. 11 direct spokes. G.M. hubs, 8 in. x 4 in. Ball bearings to steering wheel, plain to driver and crank shaft. Stanley, rudder head. Rack and pinion steering. Adjustable spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 6in. throw. Rubber pedals, plain. Chain driving. Pull-up lever double tyre brake. Adjustable seat rod. S spring. Long-distance saddle. Footrests on frame. Adjustable wrench. Oilcan. Valise. Width 42in., reducible to 36in. by taking off the loose wheel. Weight 84lbs. Hayfork frame.

$$
\text { Price .. .. .. .. } £ 14 \text { 0s. 0d. }
$$

Sent out with plated handle fittings, rest painted in three colours.
Extras. Lamps, 10s. 6d.; bell, 4s. 6d.
Remarks. A soundly built roadster, of the regulation "Meteor" pattern. (See Advertisement.)

## SPEEDWELL—D.D.

## W. G. Lewis \& Co., Speedwell Works, Romford, London.

## Leading Features. Front steering. Double driving with balance gear.

Description. Two 48 in . and one $\therefore 0 \mathrm{in}$. wheel. Driving wheels 48 in ., running level. ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 64 and 20 direct spokes. Iron hubs, $6 \mathrm{in} . \mathrm{x} 4 \mathrm{in}$. Ball bearings to all wheels, and plain to crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 6in. throw. Rubber pedals, plain. Chain driving, and Lewis's double driving gear. Push lever band brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on
frame. Flat wrench. Oilcan. Valise. Width 40 in. Weignt 901 bs. Loop frame.

Specialties. Lewis's double driving gear.

$$
\text { Price .. .. .. .. } \quad \text {.. } 22 \text { os. 0d. }
$$

Sent out with plated spokes and handle fittings, rest japanned in two colours.
Remarks. I have not yet inspected this machine, but believe it to be a fair article.

## SPECIAL DEV.ON-D.D.

Maynard Harris \& Co., 126, Leadenhall Street, London, E.C.


Old Style of Hill-Climbing.


New style of Hill-Climbing by means of the "Swing Frame."

THE SPECIAL DEVON.
Leading Features. Front steering. Double driving with two chains. Position alterable for hill work.

Description. Two 50 in . and one 18in. wheel. Driving wheels 50in., running as 45 in . $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 and 25 , No. 11 direct spokes. G.M. hubs, $6 \frac{1}{2}$ in. x 4 in . Coned bearings to steering wheel, plain to drivers, and ball to crank shaft. Stanley rudder head. Rack and pinion steering. Spade handles. Devon swing frame. Double-cranked pedal shaft, 6 in. throw. Non-slipping rubber pedals, plain. Double chain driving, and ratchet double driving gear. Push lever doukle band (8in. x ${ }_{4}^{3 i n}$.) and Devon foot ground brakes. Adjustable seat rod. Devon sliding spring. Suspension roller saddle. Footrests on frame, and pedals also form footrests. Adjustable wrench. Oilcan. Valise. Width 39in. Weight 98lbs. The frame is a weldless steel tube loop, with the swing frame attached to carry the cranks and seat.

Specialties. Devon swing frame (page 52). Devon foot ground brake (page 100). Jones's sliding spring and Jones's roller saddle (page 52).

$$
\text { Price .. .. .. .. } \begin{aligned}
& \text {.. } 22 \text { 0s. 0d. } . ~
\end{aligned}
$$

Sent out with bright handle fittings, rest painted in two colours.
Extras. Luggage carrier, 8s. 6d.; portmanteau, 20s.; lamps, 17s.; bell, 3s. 6d.

Remarks. A solidly constructed roadster in every sense of the term. The swing frame enables the vertical position to be kept on all gradients, or either thrusting or vertical action to be taken at will, whilst the fitting of two brakes make it exceedingly safe down steep inclines. (See Advertisement.)

## SPRING NON-VIBRATOR.

Broadbent Cycle Co., Hurley Road, Lower Kennington Lane, London, S.E.
Leading Features. Open front. Rear steering. Single driving. Spring frame.

Description. Two 48 in . and one 17 in . wheel. Driving wheel 42 in ., running as 48 in . ${ }_{8}^{7} \mathrm{in}$. and ${ }_{8}^{5} \mathrm{in}$. rubbers. Crescent rims. 60 and 20, No. 11 direct spokes. G.M. hubs, 5 in . $x 4 \frac{1}{2} \mathrm{in}$. Coned bearings, to steering wheel, plain to driver and crank shaft. Stanley rudder head, with patent spring adjustment. Rack and pinion steering. Adjustable spade steering handle, and pear-shaped purchase handle. Double-crauked pedal shaft, 6in. throw. Rubber pedals, plain. Chain driving. Pull-up lever double tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Valise. Width 34in., reducible to 28 in . by taking off the loose wheel. Weight 85lbs. Hayfork frame.

Specialties. Patent spring to prevent vibration in steering head (addenda). Price .. .. .. .. £12 12s. 0d.
Sent out with bright spokes and handle fittings, rest painted in two colours.
Extras. Plated hubs, 10 s . ; handle fittings, 20 s .
Romarks. A neatly built machine of the Meteor type, with arrangement for reducing vibration in the frame to a minimum.

## STAR.

## J. Parr, Navigation Street, Leieester.

## Leading Features. Open front. Rear steering.

Description. Two 46 in . and one 20 in . wheel. Driving wheel 46 in ., running level. $\frac{7}{8} \mathrm{in}$. and $\frac{1}{1} \frac{1}{6} \mathrm{in}$. rubbers. Crescent rims. 60 und 20 , No. 10 direct spokes. G.M. hubs, 43 in . x 4 in . Ball bearings to all wheels. Stanley rudder head. Rack and pinion steering. Spade handle. Pear-sbaped purchase handle. Double-cranked pedal shaft, running in ball bearings. Rubber pedals, plain. Chain driving. Double tyre brake. Adjustable seat rod. Elliptical spring. Cushioned seat. Footrests on frame. Wrench. Oilcan. Valve lubricators. Weight 801 bs . Width 36 in ., reducing to 30 in . by taking off loose wheel. Hayfork frame.
Price .. .. .. .. £16 16s. 0d.

Sent out with steering rod and hanc̉les plated, rest painted.

- Remarks. This machine is a good sound article of the ordinary type.


## STAR DOUBLE DRIVER-D.D.

## J. Parr, Navigation Street, Leicester.

Leading Features. Open front. Rear steering. Double driving with two chains.
Description. Two 46 in . and one 18 in . wheel. Driving wheels 46 in ., running level. $\frac{11}{16} \mathrm{in}$. and 3 in . rubbers. Crescent rims. 60 and 20, No. 10 direct spokes. G.M. hubs, $4_{4}^{3 i n}$ x 4 in. Ball bearings to all wheels. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft. running in ball bearings. Rubber pedals on ball bearings. Double chain driving, and Parr's patent double driving gear. Double tyre brake. Adjustable $\Gamma$ seat rod. Elliptical spring. Cushioned seat. Footrests on frame. Wrench. Oilcan. Valve lubricators. Weight 841 lbs . Width 39in. Hayfork frame.

Specialties. Parr's patent driving gear.

$$
\text { Price .. .. .. .. } 19 \text { 0s. 0d. }
$$

Sent out painted in two colours, with brake and rudder fittings plated.
Remarks. I have not seen this, so cannot say more than that Parr turns out sound work, and that the machine drives both wheels both forwards and backwards, and allows the feet to remain stationary for descending hills.

## STERLING.

Adam Burdess, Sterling Works, Spon Street, Coventry.



THE STERLING.
Leading Features. Open front. Rear steering. Single driving. Reverse motion of the feet. Two speeds for hill work. Non-liability to tilt.

Description. Two 46 in . and one 20in. wheel. Driving wheel $46 \mathrm{in} .$, running as 52 in . and 40 in . $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. Direct spokes. G.M. hubs. Burdess patent ball bearings to all wheels, and plain to crank shaft. Stanley rudder liead. Sterling screw steering. Spade handles. Double-cranked pedal shaft, 6 in. throw. Rubber pedals, plain. Burdess patent two-speed driving gear. Screw-up double tyre brake. Burdess's suspended saddle and springs. Pedals form footrests. Adjustable wrench. Oilcan. Width 37in. Weight 80lbs. Hayfork frame.

Specialties. Burdess ball bearings (page 36). Burdess screw steering (page 62). Burdess brake application (page 99). Burdess two-speed driving gear (page 87). Burdess's suspended saddle and springs (page 51).
Price .. .. .. .. £24 3s. 0d.

Sent out with bright spokes and handle fittings, rest painted in two colours.
Remarks. This machine, although a rear steering single driver, has many good points, notably that shen ascending hills the feet are moved backwards, and all tendency to tilt the back wheel is removed. The saddle is most comfortable, and the two-speed gear one of the simplest in the market. For forward driving an intermediate wheel is used in place of the chain spoken of in my description of the gear. The steering is very firm, and the brake powerful. It is well and strongly built. It is also made as a double driver with one speed, as well as, if desired, without the extra hill gear.

## SUTTON-D.D.

The Bicycle \& Tricycle Sale Rooms Co., 57, Chancery Lane, London, W.C.
Leading Features. Front steering. Double driving with balance gear. Reducible for stowage.

Description. Two 48 in . and one 18 in . wheel. Driving wheels $48 \mathrm{in} .$, running level ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 70 and 24 , No. 11 direct spokes. G.M. hubs, $5 \frac{1}{2} \mathrm{in} . \mathrm{x} 4 \mathrm{in}$. Ball bearings to steering wheel, plain to drivers and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 6in. throw. Rubber pedals, plain. Chain driving, and Starley's
patent double driving gear. Push lever band (6in. $\times \frac{7}{8} \mathrm{in}$.) brake. Adjustable $\Gamma$ seat rod. Arab Cradle spring. Long-distance saddle. Footrests on frameFlat wrench. Oilcan. Width 39in., reducible to 29in. by Lee and Stodart's patent. Weight 85lbs. Loop frame of weldless steel tube.

Specialties. Rudge's ball bearings (page 35). Starley's balance gear (page 80)Lee and Stodart's patent method of reducing width (page 42). Harrington's enamel.

$$
\text { Price .. .. .. .. } 25 \text { 0s. 0d. }
$$

Sent out with plated spokes and handle fittings, rest painted in two coloursExtras. Harrington's enamel, 10s.
Remarks. A finely finished, well built $n$ achine of the front steering class. Properly positioned and easy going. Quickly and easily reducible in width for stowage. (See Advertisement.)

## TANDEM-D.D.

Sivger \& Co., Challenge Works, Coventry.


THE TANDEM.
Leading Features. Double driving by balance gear. Convertibility into single or double forms. Front steering in single form, back steering in double. Double driving in both.

Description. Two 48in., one 24in., and one 16in. wheel. Driving wheels $48 \mathrm{in} .$, running as $42 \mathrm{in} .{ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 and 20 , No. 12 direct butt-ended spokes. G.M. hubs, 6 in. x 5 in . Ball bearings to all wheels and crank shafts. Stanley long centre rudder head. Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shafts, 6in. throw. Singer's patent rubber pedals, plain. Chain driving, and Pritchard's patent double driving gear. Push lever band (8in. x $1 \frac{1}{4} \mathrm{in}$.) brake. Adjustable flat-topped
$\Gamma$ seat rod. Elliptical springs. Suspension seat and saddle. Footrests on frame. Flat wrench. Oilcan. Width 38in. Weight $1301 b s$. The frame is a weldless steel loop, with single side back stay in the single form, the same in fact as used in the Apollo. The rear portion consists of two long side tubes, an upright seat tube at their junction, and a pair of cranks, handles, and extra wheel.

Specialties. Singer's pedals (page 26). Pritchard's balance gear (page 82). Frame and method of converting. Harrington's enamel. (page 123).

$$
\text { Price .. .. .. .. .. .. } £ 35 \text { 0s. 0d. }
$$

Sent out with plated hubs, spokes, and handle fittings, rest painted in two colours or enamelled plain black in Harrington's enamel.

[^2]
## TELESCOPIC—D.D.

Hickling \& Co., Queen Street, Maidenhead.
Leading Features. Front steering. Double driving with clutch gear. Central gear. Telescoping for stowage.

Description. Two 48 in . and one 22 in . wheel. Driving wheels $48 \mathrm{in} .$, running level. $\frac{7}{8} \mathrm{in}$. and $\frac{3}{\frac{3}{2} i n . ~ r u b b e r s . ~ C r e s c e n t ~ r i m s . ~} 60$ and 24 , No. 11 direct spokes. G.M. hubs, $5 \frac{1}{2} \mathrm{in}$. x $4 \frac{1}{2} \mathrm{in}$. Ball bearings to all wheels and to cranks. Stanley rudder head. Rack and pinion steering. Adjustable spade handles. Bicycle cranks, 6 in. throw. Rubber pedals, plain. Contral chain driving, and ratchet double driving gear. Push lever band (5in. x ${ }_{8}^{7} \mathrm{in}$.) brake. Adjustable 「 seat rod. Elliptical spring. Long-distance saddle. Pedals form footrests. Flat wrench. Oilcan. Width 38in., reducible to 29in. by means of Hickling's Telescopic arrangement. Weight $901 b s$. T frame.

Specialties. Wired tyres. Hickling's Telescopic arrangement (page 46). Frame.

$$
\text { Price } \quad . \quad \because \quad . \quad . \quad . \quad \text { £21 0s. 0d. }
$$

Sent out with plated handle fittings, rest painted in three colours.
Remarks. This was the earliest telescopic tricycle made, as well as being the first central geared front steerer, Messrs. Hickling \& Co. having introduced it nearly five years since. It is soundly and strongly made, and can be relied upon.

TIMBERLAKE SOCIABLE-D.D.
Thos. Timberlake \& Co., 39, King Street, Maidenhead.


Leading Features. Rear steering. Independent double driving.
Description. Two 40 in . and one 20 in . wheel. Driving wheels 40 in ., running level. ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 48 and 24 , No. 11 direct spokes. G.M. hubs, 7in. x 4in. Ball bearings to steering wheel, plain to drivers and crank shafts. Stanley rudder head. Rack and pinion steering. Adjustable spade steering handle, and pear-shaped purchase handles. Double-cranked pedal shafts, 6 in . throw. Rubber pedals, plain. Chain driving, with Warman's patent chains. Timberlake lever double tyre brake. Adjüstable seat rod. S spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Width 58in. Weight 143lbs. The frame is a double hayfork.

Specialties. Wired tyres. Timberlake brake (page 100). Warman's driving chains (page 69).

$$
\text { Price .. .. .. .. } £ 20 \text { 0s. 0d. }
$$

Sent out with bright spokes and handle fittings, rest painted in two colours. Extras. Plated bright parts, 40 s. ; all plated, $£ 8$; balls to large wheels, 35 s . Remarks. This is strongly built, and cheap for a sociable.

## TRANSPORT.

## S. B. Allport, 50, Whittall Street, Birmingham.

Leading Features. Open front. Rear steering. Single driving.
Description. Two 44 in . and one 20 in . wheel. Driving wheel 44 in ., running as 50 in . $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 50 and 20, No. 11 direct spokes. G.M. hubs, $5 \frac{1}{2} \mathrm{in}$. x 4 in . Coned bearings to steering wheel, plain to driver and crank shaft. Stanley rudder head. Rack and pinion steering. Spade handles. Double-cranked pedal shaft. Rubber pedals, plain. Chain driving. Pull-up lever double tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Folding footrests. Adjustable wrench. Oilcan. Bell. Two lamps. Width 35 in., reducible to 29 in . by taking off the loose wheel. Weight 77 lbs . Hayfork frame.

$$
\text { Price .. .. .. .. } \quad 18 \text { 18s. 0d. }
$$

Sent out with plated handle fittings, rest painted in two colours.
Remarks. A good machine, of the ordinary pattern. Machine-made throughout, and very carefully and accurately fitted. It has no especial novel features, but is to be relied on for quality and good work. (See Advertisement.)

## VICTORIA—D.D.

Warinan, Layon \& Youett, West Orchard, Coventry.

## Leading Features. Front steering, Double driving with clutch gear.

Description. Two 46in. and one 16 in . wheel. Driving wheels 46 in ., running level. ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. Direct spokes. G.M. hubs. Coned bearings to steering wheel, plain to drivers and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade steering handle, and pear-shaped purchase hanale. Double-cranked pedal shaft, $5 \frac{1}{2}$ in. throw. Detachable rubber pedals, plain. Warman's patent chain driving, and clutch double driving gear. Push lever band (6in. x lin.) brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Flat wrench. Oilcan. Width 36 in . Weight 90 lbs . The frame consists of a cross-tube carrying the wheels, with a central tube carrying the bracket to which the chain wheel and cranks are attached.

Specialties. Frame. Clutches. Warman's patent driving chains (page 69).
Price .. .. .. .. £16 16s. 0d.

## Sent out painted in two colours.

Remarks. A soundly constructed, neat front steerer, of a handy and useful type.

VICTORIA No. 1.-D.D.
Thresher and Stiss, 8, Wells Terrace, Stroud Green Road, Finsbury Park, London, N.
Leading Features. Front steering. Double driving with clutch action. Two speeds if desired.
Description. Two 48in. and one 18in. wheel. Driving wheels 48 in ., running level. ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{7} \mathrm{in}$. rubbers. No. 12 and 13 butt-ended direct spokes Crescent rims. G.MI. hubs, $5 \frac{1}{2} \mathrm{in}$. x 4 in . Ball bearings to all wheels, plain to crank shaft. Rack and pinion steering. Stanley head. Adjustable spade handles. Doublecranked pedal shaft, 6 in. throw. Four-bar rubber pedals, plain. Chain driving, and Thresher \& Sims' double driving gear. Push lever band (6in. x lin.) brake. Adjustable $\Gamma$ seat rod. Cradle spring. Pan seat. Footrests on frame, and pedals form footrests. Spanner. Oilcan. Width 39in. Weight 85lbs. Loop frame, with rudder well in front.
Specialties. Thresher \& Sims' driving clutch (page 76). Victoria two-speed gear (page 90 ).
Price .. .. .. .. £21 0s. 0d.

Sent out with plated fittings, rest painted in two colours.
Remarks. This is a lightly built, soundly constructed front steerer, with full vertical action and other good points.

## VICTORIA No. 2-D.D.

Thresher and Sims, 8, Wells Terrace, Stroud Green Road, Finsbury Park, London, N.
Leading Features. Open front. Rear steering. Double driving with two chains.

Description. Two 46 in . and one 18 in . wheel. Driving wheels 46 in ., running level. Crescent rims. ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Nos. 12 and 13 butt-ended direct spokes. G.M. hubs, $5 \frac{1}{2} \mathrm{in}$. x 4 in . Ball bearings to all wheels, plain to crank shaft. Rack and pinion steering. Stanley head. Adjustable spade handles. Double-throw pedal shaft, 6 in. throw. Four-bar rubber pedals, plain. Double chain driving, and Thresher and Sims' double driving gear. Push lever band (6in. x lin.) brake. Adjustable $\Gamma$ seat rod. Cradle spring. Pan seat. Pedals form footrests. Spanner. Oilcan. Width 37in. Weight 80lbs. Hayfork frame, with forks sloping slightly back.
specialties. Thresher and Sims' driving clutches (page 76).

$$
\text { Price .. .. .. .. } £ 18 \text { 0s. 0d. }
$$

Sent out with plated fittings, rest painted in two colours.
Remarks. A most vertically built rear steerer, carrying out the principle in the fullest degree.

## VICTOR EXCELSIOR--D.D.

Bayliss, Thomas \& Co., Excelsior Works, Coventry.
Leading Features. Front steering. Double driving with balance gear.
Description. Two 46 in . and one 16 in . wheel. Driving wheels 46 in ., running level. $\frac{13}{1} 3 \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 and 24 , No. 11 direct buttended spokes. Bell-metal hubs, $6 \frac{1}{2} \mathrm{in}$. x $3{ }^{3} \mathrm{in}$. Ball bearings to all wheels, and plain to crank shaft. Stanley rudder head. Rack and pinion steering. Excelsior adjustable spade handles. Double-cranked pedal shaft, 6 in. throw. Rubber pedals, plain. Excelsior wheel driving, and Starley's patent double driving gear. Push lever band ( $8 \frac{1}{2} i n . ~ x ~{ }_{8}^{7} \mathrm{in}$.) brake. Adjustable $\Gamma$ seat rod. Elliptical spring. Brooks' flexible saddle, with back rest. Rubber footrests on frame. Flat wrench. Oilcan. Width 39in. Weight 89lbs. Loop frame.

Specialties. Excelsior adjustable handles (page 59). Excelsior wheel gear (page 79). Excelsior spring adjustment (page 53). Starley's balance gear. (page 80).


THE VICTOR EXCELSIOR.
Price .. .. .. .. £20 0s. 0d. Sent out painted in two colours.
Extras. Plated bright parts, 40s.
Remarks. This is a reliable and strongly built roadster. fit for all sorts of general work. It is of the now most popular pattern, and the Salvo balance gear.is used by special licence. (See Advertisement.)

## VICTOR ROTARY-D.D.

Overman Wheel Co., Courant Buildings, Hartford, Conn., U.S.A.
Leading Features. Front steering. Double driving with balance gear. Machine built.

Description. Two 50 in . and one 16 in . wheel. Driving wheels 50 in ., running as 46 in . $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. compressed rubbers. Crescent rims. 60 and 20, No. $\cdot 087$ and $\cdot 098$ direct doubly-butted spokes. G.M. hubs, 6 in . x 3 in. Eolus ball bearings to all wheels, and universal jointed plain to crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade celluloid handles. Double-cranked pedalshaft, 7in. throw. Four-bar rubber pedals, plain. Chain driving, and Victor double driving gear. Push lever band brake. Adjustable 「 seat rod. Arab Cradle spring. Long-distance saddle. Hinged rubber footrests on frame. Flat wrenches. Oilcan. Width 40in. Weight 881bs. The frame is a loop of weldless steel tube specially imported from England.

Specialties. White celluloid handles (page 58). Compressed rubbers. Victor balance gear (page 84). Harrington's enamel (page 123).

$$
\text { Price .. .. .. .. } \quad £ 29 \text { 3s. } 4 \mathrm{~d} \text {. ( } \$ 140.00 \text { ) }
$$

Sent out with plated hubs, nuts and fittings, rest enamelled in Harrington's enamel.

Remarks. This machine is built on the lines of the National and Premier combined, and is constructed by the Ames Sword Co. for the Overman Wheel Co., the tubing, bearings, and most of the other parts being imported from England for the purpose. It is machine built on the best American interchangeable principles, and is finished and fitted in a highly skulled manner. It has the merit of being the first American-built front steering, balance-geared tricycle. (Sec Advertisement.)


THE VICTOR ROTARY.

## VOLANTE-D.D.

Toledo Steel Co., Ryland Road, Kentish Town, London, N.W. Leading Features. Front steering. Double driving with balance gear.
Description. Two 50 in . and one 16 in . Wheel. Driving wheels 50 in . running as $46 \mathrm{in} .{ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 and 24, No. 14 direct buttended spokes. G.M. hubs, 6in. x 5in. Ball bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 6 in. throw. Rubber pedals, plain. Chain driving, and Volante double driving gear. Pull-up lever band (8in. $x{ }_{8}^{7} \mathrm{in}$.) brake. Adjustable seat rod. Arab Cradle spring. Long-distance saddle. Footrests on frame. Two fflat wrenches. Oilcan. Valise. Width 38in. Weight 93lbs. Loop frame.

Specialties. Volante balance gear.
Price .. .. .. .. £20 0s. 0d.

Sent out with bright spokes and handle fittings, rest painted in two colours.
Remarks. A soundly built, reliable, front steering double driver.

## VOLANTE No. 1-D.D.

Toledo Steel Co., Ryland Road, Kentish Town, London, N.W.
Leading Features. Front steering. Double driving with balance gear. Two tracks.

Description. Two 50 in . and one 18 in . wheel. Driving wheels $50 \mathrm{in} .$, running as 46 in . ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 and 24 , No. 14 direct buttended spokes. G.M. hubs. 6in. x 5in. Ball bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade steering handle, and pear-shaped purchase hand̄le. Double-cranked pedal shaft, 6 in . throw. Rubber pedals, plain. Chain driving, and Volante double driving gear. Push lever band (8in. x ${ }_{8}^{7} \mathrm{in}$.) brake. Adjustable seat rod. Arab Cradle spring. Long-distance saddle. Footrests on frame. Flat adjustable wrench. Oilcan. Width 37in. Weight 3tlbs. The frame is somewhat of the $\Gamma$ shape, running out in front on one side, and carrying tine steering wheel just in front of one of the drivers.

Specialties. Frame. Two tracks. Volante balance gear.
Price .. .. .. .. £20 0s. 0d.

Sent out with bright spokes and handle fittings, rest painted in two colours.
Remarks. Fully equal to the last in every respect, but made with two tracks in place of three. Is a perfect double driver, both forwards and backwards.

## VOLANTE No. 2.

Toledo Steel Co., Ryland Road, Kentish Town, London, N.W.
Leading Features. Open front. Rear steering. Single driving.
Description. Two 46in. and one 18 n . wheel. Driving wheel 46 in ., running level. ${ }_{8}^{7}$ in. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 56 and 20, No. 14 direct spokes. Steel hubs, 6in. x 5ın. Ball bearings to steering wheel, plain to driver and crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 6 in . throw. Rubber pedals. plain. Chain driving. Pull-up double tyre brake. Adjustable seat rod. Elliptical spring. Long-distance saddle. Footrests on frame sides. Two flat wrenches. Oilcan. Valise. Width 38in., reducible to 3 Cin . by taking off the loose wheel. Weight 80lbs. Hayfork frame.

$$
\begin{gathered}
\text { Price .. .. .. .. £ } £ 14 \text { 10s. 0d. } \\
\text { Sent out japanned in bwo colours. }
\end{gathered}
$$

Remarks. A strong and reliable machine of the ordinary type, with no especial features.

## WEATHERILL—D.D.

## H. Weatherill, 33, Beech Street, Hightown, Manchester.

Leading Features. Open front. Direct action. Double driving with friction clutches.

Description. Two 48 in . and one 26 in . wheel. Driving wheels 48 in ., running level. ${ }_{8}^{2} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$ rubbers. Bell's patent rims. Direct spokes. G.M. hubs, 6 in. x 5in. Ball bearings to all wheels. Stanley ${ }^{\text {or rudder head. Rack and }}$ pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked axle shaft. Rubber pedals, plain. Direct driving, and Weatherill double driving gear. Push lever double friction brake. Adjustable seat rod. Elliptical spring. Suspension saddle. Pedals form footrests. Adjustable wrench. Oilcan. Width 42 in ., reducible to 24 in . by taking off both wheels. Weight 85 lbs . The frame is of the hayfork type, with high straight front.

Specialtics. Weatherill driving gear (page 79). Weatherill brake (page 80).

$$
\text { Price .. .. .. .. } \quad 17 \text { 17s. } 0 \text { d. }
$$

Sent out painted in two colours.
Remarks. This machine places the rider high, and whilst it drives both wheels equally well both forwards and backwards, allows the pedals to be used as footrests at will. Driving direct on the axle of the two wheels it is a powerful hill-climber.

## WESTON—D.D.

D. G. Weston, 38, Myddleton Street, London.

Leading 'eatures. Front steering. Double driving with balance gear. Central gear.

Description. Two 46 in . and one 16in. wheel. Driving wheels $46 \mathrm{in} .$, running as 43 in . ${ }_{4}^{3} \mathrm{in}$. rubbers. Crescent rims. 48 and 20 direct spokes. G.M. hubs. Ball bearings to all wheels, and plain to cranks. Stanley rudder head. Rask and pinion steering. Adjustable spade handles. Bicycle cranks, $5 \frac{1}{2} \mathrm{in}$. to 6 in . throw. Rubber pedals, plain. Central chain driving, and Weston double driving gear. Push lever band (6in. x lin.) brake. Adjustable seat rod. Elliptical spring. Long-distance saddle. Footrests on frame. Flat wrench. Oilcan. Width 39in., reducible to 24 in . by taking off both wheels. Weight 801 bs . T frame of weldless steel tube.

Specialties. Frame. Weston double driving gear (page 85).
Price .. .. .. .. £21 0s. 0d.
Sent out with plated handle fittings, rest painted in two colours.
Extras. Cradle spring, 10s.; balls to cranks, 20s. ; ${ }_{8}^{7} \mathrm{in}$. rubbers, 10s.
Remarks. This machine attracted much notice at the Stanley Show. It is well built, and of graceful outline; the gear is central, the action vertical, and it is at the same time a front steering double driver, as well as a very light machine. (See Advertisement.)

> WOLSELEY No. 1.-D.D.
> A. Philurps, Excelsior Works, Rea Street South, Birmingham.

the wolseley no. 1.
Leading Features. Open front. Double driving with two chains. Drives backwards and forwards equally well.

Description. Two 44in. and one 18in. wheel. Driving wheels 44in., running level. ${ }_{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. No. 11 direct spokes. G.M. hubs, $5 \frac{1}{2} \mathrm{in}$. $\times 4 \frac{1}{2} \mathrm{in}$. Ball bearings to all wheels, and plain to crank shaft. Stanley rudder head. Kack and pinion steering. Spade handles. Doublecranked pedal shaft, $5 \frac{1}{2}$ in. throw. Rubber pedals, plain. Double chain driving, and Wolseley double driving gear. Pull-up lever double tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Pedals form footrests. Adjustable wrench. Oilcan. Valise. Width 39in. Weight 90lbs. Hayfork frame.

Specialties. Wolseley double driving gear (page 80).
Price .. .. .. .. £21 0s. 0d.
Sent out with plated spokes and handle fittings, rest painted in two colours.


#### Abstract

Remarks. This machine is well built throughout. As may be seen by reference to my description of the driving gear, it drives both wheels rigidly forwards and backwards in a straight line, frees the outer wheel automatically in turning, and allows the pedals to be used as footrests by pulling a small handle. (See Advertisement.)


## WOLSELEY No. 2.

Albert Phillips, Excelsior Works, Rea Street South, Birmingham.
Leading Features. Open front. Rear steering. Single driving.
Description. Two 44 in . and one 18 in . wheel. Driving wheel 44 in ., running level. ${ }_{8}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 50 and 24, No. 11 direct spokes. G.M. hubs, $5 \frac{1}{2} \mathrm{in} . \times 4 \frac{1}{4} \mathrm{in}$. Ball bearings to all wheels, and plain to crank shaft. Stanley rudder head. Rack and pinion steering. Spade handles. Doublecranked pedal shaft, $5 \frac{1}{2}$ in. throw. Rubber pedals, plain. Chain driving. Pullup lever double tyre biake. Adjustable seat rod. Elliptical spring. Pan seat. Folding footrests, on frame. Two flat wrenches. Oilcan. Valise. Width 38in., reducible to 30 in . by taking off the loose wheel. Weight 80lbs. Hayfork frame.

$$
\text { Price .. .. .. .. } 18 \text { 0s. 0d. }
$$

Sent out with plated spokes and handle fittings, rest painted in two colours. Extras. Balls to crank ends, 15s.
Remarks. An easy running, soundly constructed machine, with no very special features. (See Advertisement.)

## THE CENTRAL ATHLETIC DEPOT

## $W_{x} d \times \operatorname{PdC} \mathbb{E}_{2}$ TAILOR AND ATHLETIC OUTFITTER, 171, Fenchurch Street, London, E.C.

(3 doors from Gracechurch Street),
Is officially appointed Tailor to the Cyclists' Touring Club, for style and careful finish.
SOLE MAKER OF THE " PERFECTA" TRICYCLE SHOE, (Recommended by Mr. Lacy Hillier.)
※્trerything New in Tricycle Sundries and "Celluloid" Collàrs and Cuffs.

STEPHEN WITHERS (late of Cheapside) manages the department.
All best makes of Tricycles at the North London Show Rooms, 71 \& 73, Park Street, Camden Town. (Rail from Broad Street to Camden Road.)

## FIVE-WHEELED MACHINES.

Of five-wheeled "velocipedes" we have as yet but one, and this is the

## PENTACYCLE.

## W. Lewis, Tempest Works, Cleveland Road, Wolverhampton.

Leading, Features. A five-wheeled machine for five persons, each driving a wheel.
Description. Four 50in. and one 46 in . wheel, all running level. $\frac{7}{8} \mathrm{in}$. rubbers. Crescent rims. 60 No. 10 direct spokes. G.M. hubs, 6 in. x 4in. Roller bearings to all wheels. Hollow front forks. Staaley rudder head. Bicycle stiering. Horn handles. Pear-shaped purchase handles. Double-cranked pedal shafts, and bicycle cranks, running in plain bearings. Rubber pedals on plain bearings. Chain driving. D.L.S. brake. Adjustable seat rods. Double C and bicycle springs. Waddle and cushioned seats Footrests on frame. Wrench. Oilcan. Spring top lubricators. The frame is tubular, like that of the "Duo," for the front three wheels, whilst the rear pair are attached by a straight central tube.

Specialties. To carry five. Frame.
Remarks. This is the only machine in the market of its kind. It carries five persons, each driving a wheel, and I should imagine considerable speed could be got out of it. (See Advertisement.)

## MANUMOTIVE MACHINES.

For supplying the wants of persons who have by any means lost the use of their lower limbs, either partially or wholly, there has been much consideration, resulting in the production and placing on the market of the following hand-propelled tricycles :-

## BEDFORD.

## G. Wоotтon, 4, Gwyn Street, Bedford.

Leading Features. Front steering. Partially open front. Unequal wheels• Lever action.

Description. $42 \mathrm{in} ., 24 \mathrm{in}$., and 18 in . wheels. Driving wheel 42in., running level. ${ }_{7}^{7} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 50 and 20 direct spokes. G.M. hubs, $5 \frac{1}{2} \mathrm{in}$. x 4 in . Plain bearings to driver, and cones to steering wheel. Socket rudder head. Rack and pinion steering. Spade handle. Pear-shaped lever handle. Adjustable seat rod. Elliptical spring. Cushioned seat. Footrest on frame. Wrench. Oilcan. Valve lubricators. Weight 68lbs. Width 34 in . The frame consists of one main tube, running across from driver to carrying wheel, at the top of the support of which it turns and runs forwards. making a sweep round in front to the rudder. The gearing and seat are attached to the first part.

$$
\text { Price .. .. .. .. } £ 15 \text { 0s. 0d. }
$$

## Sent out painted in two colours all over.

Remarks. This machine is intended for those who have lost the use of one leg, or who have one stiff. A rest is provided in front for the weak limb, and whilst one hand does the steering the other works a lever, which acts on a double-cranked axle in conjunction with a lever worked by the other foot.


THE DREADNOUGHT.
See page 172. This is uorked mainly by the fe t, but las hand porer as well. (See Advertisement.)

## FAVOURITE ROTARY--D.D.

Manchester Tricycle Co., 14, Exchange Arcade, Deansgate, Manchester.


THE FAVOURITE ROTARY.
Leading Features. Open front: Steering with the knees. Double driving with two chains. Rotary hand levers.

Description. Two 42 in . and one 20 in . wheel. Driving wheels 42 in ., running as 36 in . $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 and 20 direct spokes. G.M. hubs. Ball bearings to all wheels. Stanley rudder head. Steering with the knees. Favourite driving levers. Chain driving, and ratchet double driving gear. Double tyre brake. Adjustable seat rod. Elliptical spring. Cushioned seat. Footboand in front of frame. Adjustable wrench. Oilcan. Pell. Width 36 in . Weight 901 bs . Hayfork frame.

Specialties. Favourite Rotary hand levers (page 67). Steering with the knees.

Price .. .. .. .. £ 18 18s. 0d.
Sent out with plated hubs, spokes, and handle fittings, rest painted in two colours.
Remarlis. This machine is powerful an $\overline{1}$ strons, and is easily manipulated. It is intended for those who have quite lost the use of their legs but still have good strength in their arms. The rider sits iu the seat and pulls the handles towards him on the under back stroke. He can use both hands simultaneously, or one alone, and the gear being fitted with ratchets he can keep them still if he wishes on going down gradients. (See Advertisement)

## HAND LEVER EXCELSIOR.

Bayliss, Thonas \& Co., Excelsior Works, Lower Ford Street, Coventry.



THE HAND LEVER EXCELSIOR.

## Leading Features. Open front. Rear steering. Unequal wheels.

Description. 40 in ., 30 in ., and 20 in . wheels. Driving wheel $40 \mathrm{in} .$, running level. $\frac{7}{8} \mathrm{in}$. and $\frac{1}{1} 3 \mathrm{in}$. rubbers. Crescent rims. 60 and 24 , butt-ended direct spokes. G.M. hubs, $5 \frac{3}{4}$ in. x $3 \frac{1}{2}$ in. Ball bearings to all wheels. Stanley rudder head. Wheel and cord steering. Spade handles. Double-cranked axle shaft, running in plain bearings. Excelsior levers. Chain driving. Lever band brake. Adjustable seat rod. Elliptical spring. Suspension seat with back. Footboard. Wrench. Oilcan. Weight 901 lbs . Width 36in., reducible to 32 in . by taking off the 30 in . wheel. Hayfork frame.

Specialties. Excelsior levers (page 66).

$$
\begin{gathered}
\text { Price .. ......... } £ 18 \quad 18 \mathrm{~s} . \quad 0 \mathrm{~d} . \\
\text { Sent out painted all over in two colours. } \\
\text { Extras. Bright fittings, } 40 \mathrm{~s} \text {. }
\end{gathered}
$$

Remarks. This has a footboard in front of the frame ends, and powerful hand levers actuate the crank shaft, which is placed in the usual position of the pedal shaft, and this turns a spur wheel, which acts on the driver with an endless chain. It is well made, strong and comfortable. (See Advertisement.)

## HAND LEVER VOLANTE-D.D.

Toledo Steel Co., Ryland Road, Kentish Town, London, N.W.
Leading Features. Open front. Rear steering. Double driving with two chains.
Description. Two 44 in . and one 18 in . wheel. Driving wheels 44 in ., running level. $\frac{3}{4}$ in. rubbers. Crescent rims. 56 and 20, No. 14 direct spokes. Steel hubs, 6 in. $x$ 5in. Ball bearings throughout. Stanley rudder head. Rack and
pinion steering. Spade and pear-shaped lever handles. Double-throw crank shaft. Double chain driving, and ratchet double driving gear. Band ( 8 in. x $\frac{7}{8}$ in.) brake. Adjustable seat rod. Elliptical spring. Suspension seat. Footboard. Wrench. Oilcan. Valise. Width 39in. Weight 871 lbs . Hayfork frame.

Specialties. Hand lever rack and pinion steering gear. Volante levers (page 66).

Price .. .. .. .. .. .. £18 18s. 0d.
Sent out with bright hubs, spokes, and handle fittings, rest japanned in two colours.
Remarks. The action of this is very similar to that of the last. It can be made with auxiliary foot motion as well at an extra charge.

$$
\begin{gathered}
\text { VELOCIMAN-D.D. } \\
\text { Sivger \& Co., Challenge Works, Alma Street, Coventry. }
\end{gathered}
$$



Leading Features. Open front. Rear steering. Double driving with balance gear. Hand and foot power.
Description. Two 48 in . and one 20in. wheel. Driving wheels 48 in ., running as 42 in . $\frac{7}{8} \mathrm{in}$. and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 60 and 20, No. 12 direct spokes. G.M. hubs. Ball bearings to all wheels and axle shaft. Stanley rudder head. Velociman back steering. Velociman levers and footboard. Chain driving, and Pritcbard's patent double driving gear. Push lever band (5in. x 1in.) brake. Elliptical spring. Pan seat. Fontboard in front of frame. Adjustable wrench. Oilcan. Width 42 in . Weight 981 lbs . The frame is a longbodied hayfork of weldless steel tube.

Specialties. Velociman steering (page 61). Velociman levers (page 67). Pritchard's balance gear (page 82). Harrington's enamel.
PRICE .. .. .. .. £25 0s. 0d.

Sent out with plated fittings, rest enamelled in Harrington's enamel.
Remarks. One of the best and $m$ ost powerful hand-propelled machines in the market. It has been ridden one hundred miles in the day by a ri ler over 60 years of age. It is mainly driven by the hands, but one or both feet may be used at will to assist or relieve the arms, and either or both arms may be used, as occasion or inclination requires. The action is very much akin to that of rowing. (See Advertisement.)

## CHILDREN'S MACHINES.

The number of tricycles built specially for the use of youths and children has increased very considerably in the past year, and there is now an excellent selection from which to find a useful present. The chief feature of this year's productions has been the introduction of several machines suitable for boys of 12 and 14 years of age, and forming a medium between the ordinary tricycle and the child's machine. For children the exercise of tricycling is healthy, invigorating, and enjoyable, and parents and friends cannot select a better or more useful present.

CAMBRIAN No. 2.
Morris Bros., 16, Angel Street, Cardiff.

the cambrian no. 2.
Leading Features. Open front. Rear steering. Single driving. Rotary action.

Description. Two 34 in . and one 14 in . wheel. Driving wheel 34 in ., running level. $\frac{3}{4} \mathrm{in}$. and ${ }_{8}^{5} \mathrm{in}$. rubbers. Crescent rims. No. 12 direct spokes. G.M. hubs. Plain bearings throughout. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Doublecranked pedal shaft, $4 \frac{1}{2}$ in. throw. Rubber pedals, plain. Chain driving. Pullup lever double tyre brake. Adjustable $\Gamma$ seat rod. Cambrian spring. Pan seat. Footrests on frame. Adjustable wrench. Oilcan. Valise. Width 34in., reducible to 26 in . by taking off the loose wheel. Hayfork frame.

Specialties. Cambrian spring (addenda).

$$
\text { Price .. .. .. .. } £ 9 \text { 10s. 0d. }
$$

Sent out with bright handle fittings, rest painted in two colours.
Remarks. " A very complete and soundly constructed article, for use by children of 12 or 14 years of age.

## CHILD'S ADVANCE.

James Beech, Gladstone Works, Wolverhampton.
Leading Features. Open front. Rear steering. Single driving. Rotary action.


#### Abstract

Description. Two 30 in . and one 14 in . wheel. Driving wheel 30 in ., running level. $\frac{3}{4} \mathrm{in}$. and $\frac{5}{8} \mathrm{in}$. rubbers. Crescent rims. Direct spokes. Iron hubs. Plain bearings throughout. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-crauked pedal shaft, 4in. throw. Rubber pedals, plain. Chain driving. Pull-up lever back-wheel tyre brake. Adjustable seat rod. C spring. Cushioned seat. Flat wrench. Oilcan. Width 30 in . Hayfork frame.

Price .. .. .. .. £3 10s. 0d. Sent out painted in two colours. Extras. Larger wheels, 5 s. per 2 in. Remarks. A very low-priced tricycle.


## CHILD'S MERCURY.

## Mercury Machinists' Co., Aston Road, Birmingham.

Leading Features. Open front. Rear steering. Single driving. Rotary action.

Descripticn. Two 2 tin. and one 12in. wheel. Driving wheel 24 in ., running level. ${ }_{8}^{5} \mathrm{in}$. and $\frac{1}{2} \mathrm{in}$. rubbers. Crescent rims. Direct spokes. G.M. hubs. Plain bearings throughout. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shaft, 4 in . throw. Iron pedals, plain. Chain driving. Adjustable seat rod. Elliptical spring. Cushioned seat. Flat wrench. Oilcan. Width 26in. Hayfork frame.

$$
\text { PRICE .. .. .. } \quad . \quad \text { £3 } 10 \mathrm{~s} .0 \mathrm{~d}
$$

Sent out with bright spokes and handie fittings, rest painted in two colours.
Remarks. Sound and strong for children of six years old or thereabouts.

## CHILD'S METEOR.

Starley \& Sutton, Meteor Works, West Orchard, Coventry.
Leading Features. Open front. Rear steering. Single driving. Rotary action.

Description. Two 30 in . and one 12 in . wheel. Driving wheel 30 in ,, running level. $\frac{3}{4} \mathrm{in}$. and $\frac{1}{2} \mathrm{in}$. rubbers. Crescent rims. Direct spokes. G.M. hubs. Coned bearings to steering wheel, plain to driver and crank shaft. Stanley rudder head. Rack and pinion steering. Adjustable spade handles. Doublecranked pedal shaft, 4 in . throw. Rubber pedals, plain. Central chain driving. Pull-up lever back-wheel tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Flat wrench. Oi،can. Width 30in. Hayfork frame.

$$
\text { Price } \underset{\text { Sent out painted in two colours. }}{\ldots} \quad \underset{\text { a }}{ }
$$

Extras. Half plated, 60s.
Remarks. One of the soundest and best machines for children under eight years of age in the market.

## CHILD'S PREMIER.

Hilliman, Herbert \& Cooper, Premier Works, Coventry.
Leading Features. Open front. Rear steering. Single driving. Rotary action.

Description. Two 24 in . and one 11in. wheel. Driving wheel 24 in ., running level. ${ }_{8}^{5} \mathrm{in}$. and $\frac{1}{2}$ in. rubbers. Crescent rims. 24 and 16 , No. 12 direct spokes. G.M. hubs. Plain bearings throughout. Stanley rudder head. Rack and pinion steering. Spade handles. Double-cranked pedal shaft, 4 in . throw. Rat-trap pedals, plain. Chain driving. Adjustable seat rod. Elliptical spring. Pan seat. Flat wrench. Oilcan. Width $26 i n$. Hayfork frame.

Specialties. Harrington's enamel (page 123).

$$
\text { Price } \quad . \quad, \quad . .
$$

Sent out enamelled all over plain black in Harrington's enamel.
Remarks. A remarkably good and sound little machine for the price, suitable for use by youngsters from 4 to 8 years of age. (See Advertisement.)

## HOWE JUVENILE.

## Howe Machine Co., Bridgeton, Glasgow.

Leading Features. Front steering. Single driving. Lever action.
Description. Two 30in. and one 16 in . wheel. Driving wheel 30 in ., running level. $\frac{3}{4}$ in. rubbers. Crescent rims. 34 and 20, No. 10 direct spokes. Iron hubs, 3in. x 2in. Ball bearings to steeriug wheel, plain to driver and carrying wheel. Open Stanley rudder head. Rack and pinion steering. Spade handles. Ásbury's driving levers. Rubber pedals, plain. Adjustable seat rod. Elliptical spring. Pan seat. Flat wrench. Oilcan. Valise. Width 30 in . The frame, which is of weldless steel tube, is after the $T$ pattern.

Specialties. Frame. Asbury's levers (page 6ŏ).

Sent out painted in two colours.
Remarks. This is one of the best children's machines made. It is a front steerer, and has ball bearings to the front wheel, whilst the frame is of weldless steel tube. The action is powerful and easy. (Ses Advertisement.)

## JUVENILE SPECIAL.

## Caroche Tricycle Co., Much Park Street and Jordan Well, Coventry.



THE JUVENILE SPECIAL.
Leading Features. Front steering. Single driving. Lever action.
Description. Two 30 in . and one 14 in . wheel. Driving wheel 30 in ., running level. ${ }_{5}^{5} \mathrm{in}$. rubbers. Crescent rims. 30 and 14 , No. 10 direct spokes. Iron hubs, $4 \frac{1}{4} \mathrm{in}$. x $2 \frac{3}{8} \mathrm{in}$. Plain bearings throughout. Socket rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase haudle. Double-cranked axle shaft, 2in. throw. Rat-trap pedals, plain. Simple lever driving gear. C springs. Cushioned seat. Width 27in. The frame is square with a " front bone," and depending rods to form fulcra for the levers.

Specialties. Frame.
Price .. .. .. .. £4 4s. 0d.

Sent out painted in two colours.
Remarks. An easy, taking, and useful tricycle for children of ten or eleven years of age and under.

## JUVENILE SPECIAL SOCIABLE.

## Caroche Tricycle Co., Much Park Street and Jordan Well, Coventry.

Leading F'eatures. Front steering. Single driving. Lever action. Riders placed back to back.

Description. Two 32 in . and one 14in. wheel. Driving wheel 32 in ., running level. $\frac{5}{5} \mathrm{in}$. rubbers. Crescent rims. 30 and 14, No. 10 direct spokes. Iron hubs, $4 \frac{1}{4}$ in. x $2 \frac{3}{8}$ in. Plain bearings throughout. Socket rudder head. Rack and pinion steering. Spade steering handle, and pear shaped purchase handle. Double-cranked axle shaft, 2in. throw. Rat-trap pedals, plain. Double lever


THE JUVENILE SPECIAL SOCIABLE.
driving gear. Scroll springs. Cushioned seats. Width 29in. The frame is the same as for the single machine just described, but is carried back to support another seat and handles, and the fulcra below carry another pair of levers.

Specialties. Frame. Arrangement of levers.

$$
\begin{aligned}
& \text { Price .. .. .. .. £5 5s. 0d. } \\
& \text { Sent out painted in two colours. }
\end{aligned}
$$

Remarks. A very cheap and useful article. Is light, handy, and easily stowed away. Is strong, and suitable for children under twelve years of age.

## JUVENILE TRIUMPH.

Warman, Laxon \& Youett, Albion Mills, West Orchard, Coventry.


THE JUVENILE TRIUMPH.

Leading Features. Open front. Rear steering. Rotary action.
Description. Two 22in. and one 14in. wheei. Driving wheel 22in., running level. ${ }_{5}^{5} \mathrm{in}$. red rubbers. Crescent rims. 24 and 16, No. 8 direct spokes. Iron hubs. Plain bearings throughout. Socket rudder head. Eccentric steering. Spade handle. Pear-shaped purchase handle. Double-cranked pedal shaft. Rubber pedals. Chain driving. Adjustable seat rod. Coil spring. Cushioned. seat. Weight 30lbs. Width 24in. Hayfork frame.

Specialties. Warman's eccentric steering (page 62).

$$
\text { Price .. .. .. .. } \quad \text {. } 3 \text { s. 0d. }
$$

Sent out painted all over in two colours.
Extras. 7s. 6d. per additional 2in. in size of front wheels.
Remarks. As complete a machine as any at the price, and the makers do a considerable trade with them.

## LITTLE WONDER.

W. Asbury \& Co., 32 $\frac{1}{2}$, Kenyon Street, Birmingham.


THE LITTLE WONDER.
Leading Features. Front steering. Single driving. Lever action.
Description. Two 30 in . and one 16 in . wheel. Driving wheel, 30 in ., running level. 5 in . rubbers. Crescent rims. 40 and 20, No. 11 direct spokes. G.M. hubs. Plain bearings throughout. Stanley rudder head. Rack and'pinion steering. Adjustable spade handles. Double-cranked axle shaft. Rubber pedals, plain. Asbury's lever driving gear. Adjustable seat rod. Elliptical spring. Cushioned seat. Flat wrench. Oilcan. Width 30 in., reducible to 26 in . by taking off the loose wheel. The frame resembles a hayfork turned upside down, more than anything else.

Specialties. Frame. Asbury's driving levers (page 65).
Price .. .. .. .. £6 6s. 0d.
Sent out painted in two colours.
Extras. Ball bearings, 63s.
Remarks. This is strong, easy action, and light, and at the same time extremely simple. It is also made with 24 in . wheels at $£ 44 \mathrm{~s}$., and in a very complete style with 40 in . wheels for adult riders at $£ 14$ 14s.

## LITTLE WONDER.

Laxton \& Smimons, Britannia Works, Jordan Well, Coventry.
Leading Features. Open front. Rear steering. Single driving. Rotary action.
Description. Two 24 in . and one 12 in . wheel. Driving wheel 24in., running level. $\frac{5}{8}$ in. and $\frac{9}{16}$ in. rubbers. Crescent rims. 36 and 20 , No. 11 direct spokes.

Iron hubs. Plain bearings thróughout. Socket rudder head. Rod and arm steering. Spade steering handle, and pear-shaped purchase handle. Doublecranked pedal shaft, 4 in. throw. Iron peduls, plain. Chain driving. Adjustable seat rod. Elliptical spring. Cushioned seat. Flat wrench. Oilcan. Width 26in. Hayfork frame.


THE LITTLE WONDER.
Price .. .. .. .. £3 3s. 0d.
Sent out painted in two colours.
Extras. With 28 in . or 30 in . wheels, brake and generally stouter build. 63 s .
Remarks. A soundly built machine for children of six or eight years of age. The firm make a very large number of them.

## LITTLE WONDER SOCIABLE-D.D.

Laxton \& Stmmons, Britannia Works, Jordan Well, Coventry.


THE LITTLE WONDER SOCIABLE.
Leading Features. Front steering. Rotary action. For two riders. Independent double driving.

Description. Two 30in. and one 16 in . wheel. Driving wheels 30 in .,-running level. $\frac{3}{4} \mathrm{in}$. and $\frac{5}{8} \mathrm{in}$. rubbers. Crescent rims. 36 and 20, No. 11 direct spokes. Iron hubs. Plain bearings to all wheels and crank shafts. Socket rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Double-cranked pedal shafts, 4in. throw. Rat-trap pedals, plain. Two-chain double driving. Central lever double tyre brake. Adjustable seat rods. Elliptical springs. Pan seats. Flat wrench. Oilcan. Width 48 in.

The frame, which is of flat iron, is of a $T$ shape, having the rudder wheel well out in front.

Specialties. Frame.

$$
\text { Price .. .. .. .. } £ 10 \text { 0s. 0d. }
$$

Sent out painted in two colours.
Remarks. This is one of the best sociables made for children's use, and is strong and useful. It is fit for children up to fourteen years of age, and is safe and steady going.

NATIONAL No. 6.
National Bicycle \& Tricycle Co., Spon STtreet, Coventry.

the National no. 6.
Leading Features. Open front. Rear steering. Single driving. Rotary motion. Direct action.

Description. Two 30 in . and one 16 in . wheel. Driving wheel $30 \mathrm{in} .$, running level. 5in. rubbers. Crescent rims. Direct spokes. Iron hubs. Plain bearings throughout. Socket rudder head. Eccentric steering. Spade handles. Double-cranked axls shaft, 4 in . throw. Rat-trap pedals, plain. Adjustable $\Gamma$ seat rod. Suspension spring. Pan seat. Flat wrench. Oilcan. Width 30 in . The frame is a flat iron hayfork.

Specialties. Direct action.
Price .. .. .. .. £3 3s. 0d.
Sent out japanned in two colours.
Extras. Part plating, 21s.
Remarks. An easy driving, light, and simple machine for children under eleven years of age. (See Advertisement.)

## WELLINGTON.

George Townend, Wellington Street, Hill Fields, Coventry.
Leading Features. Front steering. Lever action.
Description. Two 22in. and one 14 in . wheel. Driving wheel $22 \mathrm{in} .$, running level. $\frac{3}{4} \mathrm{in}$. and ${ }_{8}^{5} \mathrm{in}$. rubbers. Crescent rims. Direct spokes. Iron hubs.

Plain bearings throughout. Socket rudder head. Bath chair stearing. T handle. Iron pedals. Lever driving. Adjustable cushioned seat. Coil springs. The frame is shown in the above sketch.

Specialties. Frame and general construction.


THE WELLINGTON.
Price .. .. .. .. £3 0s. 0d.
Sent out painted all over in tiwo colours.
Extras. With 24 in . wheels, 4 s . ; 26 in . wheels, 7 s .
Remarks. There are a large number of these in use about Coventry. It was the first machine to take largely with children. A larger size, with stouter frame and 30 in . wheels, is known as the "Coventry Wellington," and sold at £4 15s.

## WELLINGTON ROTARY.

## George Townend, Wellington Street, Hill Fields, Coventry.

Leading Features. Open front. Rear steering. Intermediate wheel driving
Description. Two 32in. and one 14in. wheel. Driving wheel 32in., running level. $\frac{3}{4} \mathrm{in}$. and $\frac{5}{8} \mathrm{in}$. rubbers. U rims. Direct spokes. Iron hubs. Plain bearings throughout. Socket rudder head. Rod and arm steering. Spade handles. Double-cranked pedal shaft. Block pedals. Intermediate wheel driving. Adjustable seat rod. Elliptical spring. Mahogany seat. Hayfork frame.

Specialtics. Intermediate wheel gear on a juvenile machine.

$$
\text { Price .. .. .. .. £5 } 0 \text { s. } 0 \mathrm{~d} .
$$

> Sent out painted all over in two colours.

Extras. 10s. per 2 in . in size of wheels either way.
Remarks. This is a neat little machine, and is made in sizes from 26 in . to $34 i n$. , ranging in price from $£ 37 \mathrm{~s}$. to $£ 510 \mathrm{~s}$. The maker confines himself solely to children's machines, so gives them every attention. I believe, however, he is shortly about to commence the manufacture of adults' machines, of the front steering double driving kind, and has just erected new works for the purpose.

## YOUTH'S EXCELSIOR.

Bayliss, Thomas \& Co., Excelsior Works, Lower Ford Street, Coventry.
Leading Features. Open front. Rear steering. Single driving. Rotary motion.

Description. Two 36 in . and one 18 in . wheel. Driving wheel 36 in ., running as 40 in . $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 50 and 20, No. 9 direct spokes. Brass hubs, $5 \frac{1}{2} \mathrm{in}$. x $3 \frac{1}{2} \mathrm{i}$ in. Plain bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped
purchase handle. Double-cranked pedal shaft, 5in. throw. Rubber pedals, plain. Chain driving. Pull-up lever back wheel tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Flat wrench. Oilcan. Width 35in., reducible to 29 in . by taking off the loose wheel. Hayfork frame.
Price .. .. .. .. £10 0s. 0d.

Sent out painted in two colours.
Remarls. A soundly built useful machine, with no espesial features. Suitable for use by ladies of light build, or by youths of fifteen and under. Can be relied on to stand knocking about. (See ddvertisement.)

## YOUTH'S MERCURY.

Mercury Machinists' Co., Aston Road, Birmingham.
Leading Features. Open front. Rear steering. Single driving. Rotary motion.

Description. Two 36 in . and one 16 in . wheel. Driving wheel 36 in ., running level. $\frac{3}{4}$ in. rubbers. Crescent rims. Direct spokes. G.M. hubs. Plain bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Spade steering handle, and pear-shaped purchase handle. Doublecranked pedal shaft, 5in. throw. Rubber pedals, plain. Chain driving. Pullup lever double tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Flat wrench. Oilcan. Valise. Width 35in., reducible to 29 in . by taking off the loose wheel. Hayfork frame

Price .. .. .. .. £8 8s. 0d.
Sent out painted in two colours.
Remarks. A strong, sound machine for youths' and ladies' use. No special features.

## YOUTH'S METEOR.

Starley \& Sutton, Meteor Works, West Orchard, Coventry.

the youth's meteor.
Leading Features. Open front. Rear steering. Single driving. Rotary motion.

Description. Two 36 in . and one 16 in . wheel. Driving wheel 36 in ., running level. $\frac{3}{4} \mathrm{in}$. and ${ }_{8}^{5} \mathrm{in}$. rubbers. Crescent rims. Direct spokes. G.M. hubs. Plain hardened bearings to all wheels and crank shaft. Stanley rudder head.

Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shaft, 5in. throw. Rubber oval pedals, plain. Chain driving. Puli-up lever back wheel tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Flat wrench. Oilcau. Width 35in., reducible to 29 in . by taking off the loose wheel. Hayfork frame.

$$
\begin{gathered}
\text { Price } \ldots \quad . . \quad . \ddot{~ . . . ~} £ 10 \text { 0s. 0d. } \\
\text { Sent out painted in two colours. }
\end{gathered}
$$

Extras. Half plated, 60s.; gold lines, 15 s .
Remarks. This is one of the soundest 36 in . machines made, the makers making a special feature of it. It will carry a man, and stand any amount of knocking about. All working parts are well hardened. Suitable for youths and ladies.

## YOUTH'S PREMIER.

Hillman, Herbert \& Cooper, Premier Works, Coventry.


THE YOUTH'S PREMIER.
Loading Features. Open front. Rear steering. Single driving. Rotary motion.

Description. Two 34in. and one 17in. wheel. Driving wheel 34in., running level. ${ }_{3}^{3} \mathrm{in}$. and 5 gin . rubbers. Crescent rims. Direct spokes. G.M. hubs. Plain bearings to all wheels and crank shaft. Stanley rudder head. Rack and pinion steering. Spade handles. Double-cranked pedal shaft, $4_{4}^{3} \mathrm{in}$. throw. Rat-trap pedals, plain. Chain driving. Pull-up lever double tyre brake. Adjustable seat rod. Elliptical spring. Pan seat. Footrests on frame. Flat wrench. Oilcan. Width 35 in ., reducible to 29 in . by taking off the loose wheel. Hayfork frame.

Specialties. Harrington's enamel (page 123).

$$
\text { Price .. .. .. .. } £ 8 \text { 8s. 0d. }
$$

Sent out enamelled all over plain black in Harrington's enamel.
Remarks. Soundly constructed of good material. Is strong and reliable, and fit for use by youths and young ladies from ten to fifteen years of age. (See Advertisement.)

## WEIGHTS, WIDTHS, AND PRINCIPLES OF DRIVING

to price of standard patterns, so that hines there are in the market to suit their several depths
 The sizes of driving wheels

 taken as exact,


| Name of Machine. |  | Price. | Diameter <br> 0 F <br> Driving <br> Wheels. | Running as. | W'eнt. | Widte. | Driving. | Stearivg. | $\left\lvert\, \begin{gathered} \text { Page } \\ \text { Ders } \\ \text { Cribed } \\ \text { on. } \end{gathered}\right.$ |
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| Four-in-Hand |  | $\begin{array}{ccc} £ & \text { s. } & \text { d. } \\ 45 & 0 & 0 \end{array}$ | Inches. 48 | Inches. | lbs. <br> 224 | Inches. 57 | D.D.* | F.S. | 190 |
| Tandem ... |  | 35 o o | 48 | 42 | 130 | 38 | D.D.* | R.S. | 256 |
| Cheylesmore Convertible | $\ldots$ | 34130 | 48 | 48 | 140 | 74, $3^{8}$ | D.D.* | F.S. | 153 |
| Dual Convertible ... | $\ldots$ | 3200 | 48 | 42 | 140 | 57, 40 | D.D.* | F.S. | 173 |
| New Merlin Sociable | ... | 31100 | 42 | 60, 45 | 149 | 60 | D.D.* | F.S. | 223 |
| Apollo Sociable ... | ... | 3 I 0 | 46 | . 42 | 14.5 | . 58 | D.D.* | F.S. | 133 |


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## SECTION IV.

## the MACHiNE-How to Keep it in Order, How to Manage, and How to Select it.

凅HE tricycle procured wants some little amount of attention, and even a certain amount of learning. This latter, especially, most non-tricyclists seem to think is a requirement quite foreign to the sport. Such, however, is not the case, for although a person can sit on the tricycle and propel it without tumbling off, it requires some little skill to drive it through the streets and over hills, as well as some practice to get the hitherto unused muscles into working order. In the possession of a machine, too, one has not all, for notwithstanding the fullest instructions to the makers each machine requires to be adjusted to the rider-either the seat is too high, too low, or too far back, the handles are not right, or something else occurs to interfere with the ease and comfort of working. These to a novice usually appear as some fault with the steed itself, but an expert upon getting on a new tricycle would quickly discover if anything were wrong and where it existed, and would at once set about remedying the fault by adjustment, and so getting the best results. Almost the first thing with a new tricycle to be attended to is the height and position of the saddle, for a tall or "leggy" man will very probably find himself cramped upon trying a machine for the first time; if so, he will at once loosen the nut holding the seat or saddle rod, and adjust the same so that his leg when at its lowest position will be straight, with the toe somewhat pointing downwards, taking care at the same time that, whilst attaining this position, the leg is not uncomfortably stretched for the purpose. Should this be the case, or he finds he is unable to reach the pedals when at their lowest position, he will of course reverse the order of action and lower the saddie accordingly, and when the proper adjustment is obtained he must not forget to see that the locknut is well screwed down, and the saddle not only firm upon its rod, but "set" right, i.e., if a saddle, pointing in a direct line with the run of the machine, and if a seat, the front parallel with the axle. This done, he will require to practice constantly until he becomes accustomed to his machine, when he will no doubt find out many little points requiring alteration, and will attend to them. The handles, if unadjustable, he will in all probability have to put up with, unless he lives near an engineer's workshop, or can make the alteration himself, but he will, perhaps, after a little use, find his rack and pinion steering handle setting at an awkward angle to his hand. This will be most likely the case if at any time he has "overshot the rack" in steering, and his toothed wheel has got out of gear with the rod, as very few novices manage to put it back at the right angle, and I have known many wonder muchly how it could be set right again. The remedy in such case is simple enough. One has but to
get it out of gear again and turn the handle loosely to the amount it was out, and re-engage the teeth, repeating the operation if the first attempt has been unsuccessful. In the case of an adjustable handle the remedy is simpler still, for as most adjustable handles consist of a round rod and socket the rider need only loosen the set-pin and turn the handle to suit his taste, screwing up again when in position. To be right, the steering handle should set in a straight line with the machine, or at right angles to the axles, or if anything out of the exact straight line the front end should be a fraction of an inch inwards.

After a little use a sudiden jerk will sometimes be felt with the chain, accompanied by a rattle and click. This at first is very alarming, as the novice usually thinks the chain or something else has given way; he need not be alarmed, however, for it is caused by the chain "slipping a tooth," or failing to engage with one of the cogs upon the wheels, and is a sign that the chain is too loose and wants tightening. To effect this, a little attention to the lower or pedal wheel will show the arrangement for so doing, and will be found to be usually a slot, either horizontal or perpendicular-the latter in preference-in each fork end or bearing place in which the pedal cranks and wheel are fitted. By slackening the nuts and readjusting, the chain can be taken up to almost any extent, but care should be taken not to tighten too much, as no chain should be as tight as it is possible to make it, but only just so much as to avoid slipping any teeth, because when very tight there is a great additional strain upon the bearings, both of the driving wheels and pedal cranks, by reason of their being braced so tightly together; this produces much excess of fiction, which consequently means an increase of power requisite in propulsion. When performing this operation it must not be forgotten that both ends of the pedal rod should be adjusted equally; some manufacturers are cognizant of this fact, and mark the sides of the slots in fractions of an inch, so that an exact adjustment may be secured, the consequence of inaccuracy in this respect being that the crank and pedal wheel bearings are set askew, and this generates friction, which quickly destroys the even surfaces of the bearings. The Sparkbrook Manufacturing Compy., however, make a bad setting absolutely harmless by the adoption of the universal joint to all bearing parts, and the Royal Machine Manufacturing Co. and one or two other firms, also adopt a principle very much akin to it and answering the same end.

With a well made machine it is very probable that the bearings of the larger wheels will wear long and well, and that no adjustment will be requisite for some years; the case with the smaller wheels will, however, naturally be different, on account of the greater number of their revolutions as well as their greater acquaintance with mud and dust. These wheels for the most part are provided with either coned bearing pins, or with conically adjustable balls, and when sideshake and rattle with them make themselves known, the locking nut of the bearings must be loosened, the cone screwed up so as to allow of a very little side play, and the lock nut once more screwed down,
which will generally have the effect of taking all the side shake out of the wheel, and sometimes this extra tightening propensity of the lock nut will necessitate its being again unscrewed, and the bearing slackened a little to allow for it before the exact adjustment is obtained. When properly adjusted, a wheel should have just so much play as will allow it to run freely, and no more.

The adjustment of the steering gear is another important point requiring attention at times. The majority of tricycles are steered by a short arm projecting from the side of the rudder-wheel fork, this arm being in connection with the steering rod. The joint uniting these should be well looked after, and very often this being loose will be found the secret of some mysterious rattle which a turn of the wrench at the securing nuts here will quickly remedy. This part should always be kept free from rattle, as one then knows it is not loose, for the breaking or losing of the connecting pin would be a very serious matter if going fast-or even at a moderate pace tor the matter of that. The rudder head itself is also bound to wear loose in time, and will then need some adjustment. If it be a socket head this will be impossible, but with either the Stanley or open-centre type, adjustment is easily made. A large hexagonal nut will usually be found on the top of the head; this must be loosened, and if it forms a dust cup as well as a lock nut, taken off altogether; there will then be found a flat head to a screw going into the head, this must be tightened down until the wheel will but just turn freely, and the larger lock nut then screwed down again and made quite tight. Pedals must be kept well oiled, and on no account must this item be neglected: in some kinds provision is made for lubrication, but where none exists, the oil must be applied at both ends, revolving the pedal rapidly and tilting the machine at the same time.

Should any spokes be found to be loose, they will require tightening, the instrument most suitable for this purpose being the spoke tightener described on page ro4. In using it, it should be put upon the sp,ke lengthwise, and as near the worm as possible, firmly tightened, and the spoke carefully screwed up to its proper tension. In adjusting the spokes, care must be taken not to forget to see how the rim is bearing the adjustment. I well remember my first attempt at spoke adjusting, some years since. The back wheel of my bicycle was rejoicing in three or four loose spokes, so I took it out and screwed away with the spanner, until every spoke was as tight as it could be. During the operation I never once looked at the rim, and when I did so, found it presented the appearance of an excited eel, and certainly was more square than round. That wheel cost me $4 / 6$ to put right, but I profited by the experience, and did not go to work so recklessly again.

In adjusting them, the machine should be tilted, the axle or rrame supported on a stand, and the wheel revolved slowly, when any deviation from the truth will be at once seen, and the deflected part marked with chalk, after which the corresponding spoke must be either tightened or slackened as required, and all the spokes brought as near as possible to the same tension.

I should not, however, advise a novice to attempt "trueing" his wheel until that operation is absolutely needed, as the result arrived at by his first attempts may prove, as it did with me, to be far from "truth."

The rubber tyre will perhaps be found to be loose in parts, in which case it must be immediately attended to and secured again, as follows :-If a quantity of cement remains in the rim, no fresh will be needed; but should such not be the case, some fresh cement must be procured. This must then be melted in an iron spoon or ladle on the fire, and both rim and rubber being quite clean, it should then be poured evenly into the rim, and the rubber placed upon it; next, the cement must be again melted by holding the rim in a gas flame, or that of a spirit lamp, or better still by using one of Singer's portable tyre fasteners, and the tyre pressed down firmly upon it and secured with string. In a few hours it will be quite firm, when the string may be taken off, and any cement which has exuded at the edges cut off. No fear need be entertained as to spoiling the paint, for although rendered very black at first, it may be easily cleaned with a wet rag. Before doing this, all old cement should be. carefully removed, and both rim and rubber well cleaned with turpentine, to remove any oil which may be there.
Unless the rider be careful, the bright parts (if any) of his. machine, if unprotected from the action of the atmosphere, will speedily rust. Should this by some neglect occur, the rust may be removed by first giving them a hard rub with a rough cloth, and then going over them with fine emery cloth, finishing off with a chamois and a coat of oil. If very rusty, two or three sizes of emery cloth will be requisite, used in succession, the coarsest first, with plenty of elbow grease. To re-burnish parts, a steel burnisher will have to be used, which requires some little labour and patience to secure the desired effect; the best substitute for this is Birks' Metallic Lustre, which, when applied as directed on the packets, produces almost as good a burnish as a burnisher.

Many riders now have the bright parts of their machines plated with nickel, which gives them a fine appearance and somewhat hinders rust ; but as plating is an expensive process, and requires a. considerable amount of attention to keep in first-class order, most makers send out their machines with no bright or plated parts about them, either enamelling, painting, or japanning every part, which is. a great saving of time; and this way of finish I find seems to be generally appreciated by tricyclists, who, as a rule, use their machines. more in all weathers and as regular business carriages than do bicyclists, and so do not want to be always cleaning them. The best coating for tricycles, by a long way, is Harrington's Enamel, which, somewhat like japan in appearance, has, nevertheless, the advantage over both that substance and paint in durability, not being so subject. to chip and crack off at every blow received.

All nuts, bolts, and screws in connection with the brake and smallerparts of the machine, as well as those of more importance, must receive careful and continual attention, as, although but small things.
in themselves, their failure may prove a serious bar to enjoyment and safety. Should, at any time during a ride, an ominous rattle, unobserved before, be noticed, the pace should be slackened and every part looked at whilst in motion, to discover, if possible, its whereabouts, and this found, an immediate dismount should be made, and the refractory nut or bolt at once attended to.

Regarding the proper oil to use, much diversity of opinion exists among tricyclists, and various combinations are sold by many makers. The requisite qualities in oil are, that it should be of such consistency as to lubricate well, and at the same time not be liable to thicken and so clog the bearings. The best ordinary lubricating oil is sperm-or neat's-foot if drawn off clear; if neither of these can be obtained, in an emergency, olive oil will answer the purpose fairly until better can be procured, and of special oils I can highly recommend Tringham's ruby oil for lubricating purposes. Paraffin has the property of cleaning from thickened and inferior oils, and is very useful for cleaning the bearings; hence a good combination is made by mixing nine parts of sperm, or neat's-foot, with one of paraffin. For lighting purposes, the best to use is that recommended by the manufacturers with each form of lamp, or if none is mentioned by them, I can highly recommend Avila Tringham's electric lamp oil, or, if that cannot be procured, best French colza with a lump of camphor dissolved in it will be found most effective.

Occasionally it is found when adjusting the nuts (all nuts should be tightened immediately they show signs of slackness) on various parts of the machine that they will not hold firmly on to the bolt, but shake loose with the slightest usage. In this case an expedient is to insert a steel washer behind the nut, or if this will not do, or cannot be procured, to strike a few sharp blows on the bolt head with the spanner or a stone, which will flatten portions of the worm and cause the nut to screw on with much difficulty, consequently it will be far more unlikely to work loose by itself. About the best remedy is, however, good fitting in the manufacture, and it is in these little things the difference between high-class and cheap machines is made manifest. Having seen a little of the requirements of the machine itself, I trust

## A FEW HINTS ON RIDING

the tricycle may be of use to some, although there are many far more experienced tricyclists in our "right little, tight little island" who could, no doubt, put us all up to a wrinkle or two. Still I give them for what they are worth.
r. Let the pressure of the feet upon the pedals be as even as possible, endeavouring to put the pressure upon one treadle as you take it from the other, or, in other words, always keep the chain tight, and not allow it to be brought to a tension with a jerk at each stroke.
2. Drop the heel at the commencement of each stroke when the pedal is at the top, and at the finish of the stroke draw the heel up and drop the toe, at the same time drawing backwards. By this
means the whole of the stroke available is utilised and driving rendered easier.
3. Practise and learn to steer in a straight line by keeping a steady yet easy hold upon the helm.
4. In steering, do not give sudden and spasmodic twists to the steering handle, but turn it as gently, firmly, and steadily as possible, essaying by practice to calculate mentally the exact amount of turn required for any purpose, or to turn at any angle.
5. When travelling fast be very careful to hold the steering handle firm, and to turn less sharply than on other occasions.
6. Should a sudden turn be requisite by any unforeseen circumstance, take care to throw the body right over the inner wheel as you turn, and as much behind it as possible, if a rear-steerer.
7. Don't drive too fast or cultivate a high rate of speed, if you desire comfort, and
8. Take care to slacken speed considerably when desiring to turn sharply or to go round a corner. If this is not done a capsize is the sure result.
9. Always lean and sit well over towards the centre of the circle made in turning; the sharper the angle and the greater the speed at which it is taken the more this is necessary.
io. Never attempt to turn sharply round when going down hill.
1I. In turning a corner at which the slope of the road is in any way outwards, i.e., higher towards the centre, be careful to go very slowly and lean over more than usual.
12. Take care and back-pedal as well as use the brake until the bottom of the hill is fairly in view, and even then it is not well to take off the feet unless the machine is provided with one of the more powerful kinds of brake.
13. With a one-sided driver, or a machine having a brake on one side wheel, never put the brake on hard on a sudden, or the machine will twist round and very likely deposit its rider in the ditch.
14. In ascending hills hold the handles firmly, get as much purchase or pressure from the loins as you can.
15. You may vary this, and ease yourself in those tricycles which admit of so doing, by rising out of the seat, steadying the body with the hands, and standing upon the pedals, thus driving by the weight of the body.
16. In doing this allow all the weight to be on the descending pedal, lifting the other leg so as to keep the chain always in full tension.
17. After a little practice it will be found possible to combine both methods with advantage, pulling somewhat at the handles and standing on the pedals at the same time.
18. Don't go too fast at the commencement of a hill, but reserve your power for the top.
19. At the same time bear in mind that it often pays better to get out and walk than to struggle painfully to drive the machine up very steep gradients, as the action of walking is a change and more natural for hard work.
20. Don't sit on your machine like a $\log$ of wood, but accustom yourself to accommodate yourself to its sway on going over obstacles.
21. A very deep gully or large stone is best "taken" by leaving the seat and putting all the weight for the nonce on the handles and pedals.
22. Stones, gullies, rough patches and crossings may be avoided with the small wheel of a front-steering balance geared machine by pulling at the handles and leaning back, which will have the effect of lifting the front wheel off the ground for a second.
23. By keeping a firm hold on the handles and making all the driving from the thighs, with a firm and erect body, a machine may be driven thus on a level road for 100 yards or more.
24. With a rear steerer, sit well back, so as to place plenty of weight on the steering wheel in descending hills.
25. With a single driver of this class never check the machine suddenly with the feet, or it will cause it to swerve badly, and probably, if going fast, capsize.
26. Keep your lamps well trimmed, and see that the reservoirs are full before starting for a run, as many things may occur to keep you out till after dark.
27. Always be courteous to wayfarers, both pedestrians and drivers of horses.
28. Obey the rules of the road religiously, unless you see that the driver of any vehicle will not allow you to do so, when, to avoid a charge of " contributory negligence," it is well to act as prudence and circumstances dictate.
29. In encountering freshly laid stones, get out and walk, as it saves the tyres, the weight of the rider not being upon them.
30. Don't lend your machine to a friend who is not a rider, if you wish to preserve his friendship.

## IN THE SELECTION OF A TRICYCLE

There are many points to be considered. In the first place, the intending purchaser must consult the depth of his pocket, and that ascertained, should next proceed to find out what machines are within his reach, always remembering that the best is the cheapest in the end. These should be carefully studied, and if a good variety present themselves before him, those should be first struck off the list which are made by firms of "shaky" reputation, if this can be ascertained. Next will have to be considered the amount of room possessed for stabling purposes, and the width of the machines under examination. The kind of roads, and purposes for which required, are very knotty points, and will require very careful calculation, for many machines that will do very nicely for smooth and level roads are comparatıvely useless when brought into action over a rough and hilly district. For general light work and smooth roads almost any tricycle of good construction will answer equally well, but for much touring purposes, use in all weathers, and over hills and bad roads, very especial types of machine will be required. In
the first place, for all heavy work a double driver is advisable, and the points of the different methods by which this is obtained should be carefully gone into. Front and rear steering will be another item of consideration, and I think it will be found that the former plan is in general preferable in a hilly country. The strength and age of the rider must not be omitted in deciding the build, for very slightly built machines are totally unfit for heavy men, whereas great weight is a serious drawback to a lady or semi-invalid of the opposite sex. Brake power and capability for luggage carrying are considerations of very great importance to a touring tricyclist, and to very many the appearance will be very much against some machines, although this latter should never be allowed to weigh against points of actual merit, good looks being so much a matter of opinion that few agree upon this score about any one machine in particular ; and last but by no means least, lack of complication should not be forgotten, as well as general handiness. I trust the majority of the readers of "The Tricyclists' Indispensable Aninual " will be able to glean from its pages sufficient information to make a good selection, and a glance through the advertisement pages will give the makers a chance of saying a word for themselves, whilst should anyone be still undecided, I shall be pleased to assist them to the best of my ability, either through the columns of The Cyclist- the rider's newspaper-or by post if a stamped directed envelope is enclosed for reply, and it is just possible I may be able in this way to give intending purchasers a hint worth having.

## A CHAPTER ON ACCIDENTS.



LTHOUGH I do not for a moment wish to frighten my readers with the idea of accidents, still we know that, as the saying has it, we are liable to accidents even in the best regulated families, and so tricycling has its accidents in common with driving and all other means of locomotion, not even omitting walking. Consequently it behoves the prudent tricyclist to be in some way prepared to meet any emergencies which may arise, and with the object of helping him in this matter I make the following remarks. As, however, scarcely two misfortunes occur exactly alike, I will simply treat upon the damages most frequently sustained by tricyclists-or rather their machines--in their mishaps. I will say nothing about personal injuries, as I do not pretend to a knowledge of surgery, but will take a few of the commoner breakages and show the unfortunate one how to treat them and make his machine rideable or manageable until he reaches home and can send it to be properly repaired.

A broken spoke is perhaps the commonest mishap a cyclist meets with. Its treatment differs according to its nature and the quality of the wheel. If the machine is properly built, and the wheel good, the fracture of one or even haif-a-dozen spokes will
make but little difference in its stability, and the rider, after treating them as I am about to tell him, may proceed on his journey again " as if nothing had happened," but with a badly built wheel the case is different, and the breakage of a few spokes will contort it considerably, though it must be a very bad wheel indeed to render riding on a tricycle impossible from this cause. Should the spoke be broken off close to the hub the best way is to twist it in amongst the next three or four so as to prevent its catching in anything, leaving it until home is reached to remove it altogether, which will have to be done by loosening the rubber. In case the breakage occurs in close proximity to the rim there is nothing to be gained by leaving it in, the broken end should therefore be bent at right angles, and by this means the spoke unscrewed and removed from the hub. This in case of a breakage with a well built wheel. With a poor one, should the snapping of the spoke cause it to "wobble" dangerously and the breakage occur at the end nearest the hub, it will be found a good plan to bend the end sharply round upon itself, so as to form a hook. Then pass a piece of stout cord round the two spokes immediately on the opposite side of the hibb, as well as round the hook, and by this means brace the spoke as nearly as possible up to its former tension, lashing the ends of the cord round the spokes on the opposite side.
Loose tyres are a very common source of annoyance, and in this case "prevention is better than cure," and the rider should immediately attend to any loose places he may discover. Should the tyre come out whilst on a journey, however, and he is not provided with a supply of either of the tyre clips described in Section I, the best way is to procure some copper or iron wire, and passing short lengths of this with the aid of a sharp wet knife through the centre of the tyre at every other spoke head, unite the two ends and twist them together beneath the rim.

A buckled wheel is generally caused by a collision, an upset, or the twist of a rut or a tram line. To the novice its appearance is certainly alarming, the rim in place of being round taking the form of a figure 8, and the spokes being all awry, twisted into all shapes, and for the most part loose, so that it seems as if the whole wheel is hopelessly wrecked. The veteran, however, knows better if it is a good wheel, and will treat it as follows :-Stand by the side of it and press the left knee firmly against the centre of the hub: then place the right foot on the ground so that the part of the rim nearest the person bears against it, and with the hands take a firm hold of the two parts of the rim which are farthest away from their right position on the other side of the wheel to which the operator is standing. This done, a firm pull with both hands and an equally firm pressure with the knee in the centre will cause the wheel to retake its original shape with a sudden spring, which is most surprising to one who has never seen it done. A little adjustment of any spokes which may have been loosened by the mishap will then put all right again.

A bent steering rod can generally be pulled fairly straight without much trouble, but a broken one is a different thing, and will require some little ingenuity to make a machine rideable, even with care. Should the rider be an old water dog and able to splice a broken spar, he will doubtless with some trouble be able to manage in that way, but as in ninety-nine cases out of one hundred such would not be the case, he will have to devise some other dodge, as good a plan as any being to get a 12 in . stick, and lashing it across the head to the steering arm, so as to allow the other end to project on the other side to the arm, tie a strong cord to each end, and, discarding the broken steering rod, hold a cord in each hand and so guide the machine. Of course in such a fix the riding should be slow and careful. Another way is to get a long stick and lash it to the spanner, if of the flat variety. Then put the spanner on the nut of the steering head and lash it down firmly to the head, using the stick in the same way as a steering handle of the "bath-chair" type, or it may be possible to secure the end of the stick itself beneath the lock nut of the head, and do without the spanner.

Beyond these mishaps there are but few which can be temporarily repaired by the tyro on the road; bent frames, forks and cranks, broken axles and such like being damages of such a nature as to require the services of the expert with proper tools for the purpose. In case of the irreparable damage of the small wheel of a rear steering tricycle, the best way to manipulate the machine will be found to be to grasp the backbone close to the head, and lifting by this the rear wheel clear of the ground so propel the machine. Should the small wheel of a front steerer be damaged, it will be found that the presence of the backstay makes it exceedingly awkward to lift the fore part of the machine and draw or push it along. In most cases, however, by letting the seat and handles down as low as they will go the machine may be turned upside down, and by holding the lower part of the rim of the rudder wheel at arm's length, or by holding the tilt rod ends, if there-are two of them, a fairly easy mode of progression is secured. Damage to either or both the large wheels will render matters very awkward, but by tilting the machine and running on the small wheel and undamaged large one, it will often be found practicable to get the machine along. With a "Coventry Rotary" damage to the driving wheel may easily be got over by lifting that side off the ground by pressure on the steering handle and running it on the two small wheels alone, which it is very capable of doing.


## SECTION V.

## RACING DURING 1882.

April ioth, Godalming.-One mile handicap: P. G. Hebblethwaite (I).

April ioth, Coventry.-One mile handicap: M. J. Lowndes, Congleton, I30 yds (1) ; T. Smith, Coventry, I40 (2) ; W. J. Mills, Coventry, 60 (3). Time, 3m. 2 Is.
April ioth, Tunbridge Wells.-One mile handicap: E. Brown (I).

April ioth, Chesterfield.-One mile handicap: R. W. Cripps, scratch (I) ; T. R. Marriott, io yds (2). Half mile handicap: R. B. Webster, Chilwell, scratch (I) ; W. Bradley, Chesterfield, 40 yds (2).
April ioth, Brighton.-One mile inandicap: H. Colling, Brighton C.C., 40 yds (1); A Girling, 50 (2) ; L. Grose, 50 (3). Time, 4 m . 12 s .
April ifth, Leicester.-Two miles handicap: T. R. Marriott, Nottingham, 290 yds (I) ; T. Smith, Coventry, 290 (2) ; M. J. Lowndes, Coventry, 230 (3). Time, $6 \mathrm{~m} .50 \frac{4}{5} \mathrm{~s}$.
April ifth, Exeter.-Three miles handicap: W. H. Casley, Exeter B.C., scratch (1). Time, 12m. 57s. One mile handicap: W. H. Casley, scratch (i). Time, 3 m .58 s .
April i5th, Manor House School Sports, Balham.-One mile scratch: A. Jenner (i).
April 29th, Nottingham.-One mile handicap: R. W. Cripps, Nottingham, 70 yds (1); T. R. Marriott, Nottingham, 70 (2); R. B. Webster, Chilwell, ino (3). Time, 4 m .44 s .

April 29th, Richmond.-One mile handicap: G. Kelham, Lombard, 40 yds (1) ; H. Smith, Finchley T.C., 40 (2) ; L. Grose, Camberwell, 60 (3). Time, $7 \mathrm{~m} .49 \frac{2}{5} \mathrm{~s}$.
May $5^{\text {th, }}$ Edinburgh.-Two miles handicap: J. Hay, C.T.C., i6o yds (1) ; M. Sinclair, C.T.C., 200 (2) ; T. R. Marriott, Nottingham, scratch (3). Time, 7 m .38 s .
May 6th, Southampton. - One mile handicap : A.' Andrews, S.A.B.C., 110 yds (1) ; W. E. N. Coston, S.A.B.C., go (2). Time, 5 m . 16 s .
May 22nd, Aston Lower Grounds.-One mile handicap : M. J. Lowndes, Coventry, 30 yds (I) ; J. Hembrough, Coventry, 90 $(\dagger)$; W. J. Mills, Moseley Harriers, $50(\dagger)$. Time, $3 \mathrm{~m} .3 \mathrm{I}_{\frac{1}{5} \mathrm{~s}}$.
May 29th, Norwich.-One mile handicap; W. Rye, London (r).
May 29th, Hull. - One mile handicap : J. J. Fowler, H.A.C., scratch (1) ; F. Fisher, 155 yds (2).
May 29th, Leicester.-One mile handicap: M. J. Lowndes, 20 yds (1) ; T. Sidwell, Coventry, ioo (2) ; W. J. Mills, Coventry, 60 (3). Time, 3 m. r.gs.

May 29th, King's Lynn.-One mile: M. H. Walker (r).

May 29th, Bournemouth.-One mile handicap: W. Snook, W.B.C., 85 yds (I) ; P. T. Letchford, F.T.C., 50 (2). Time, 3m. $57 \frac{1}{2}$ s.
May 29th, Grenoble.- 3,750 metres, scratch: F. de Civry (1) ; H. O. Duncan (2); M. Berthoin (3).

May 29th, Plymouth.-One mile handicap: W. H. Casley, Exeter, scratch (I) ; E. S. Knapman, Exeter, 75 yds (2) ; C. Franks, Cambridge, 100 (3). Time, 4 m .23 s .
May 2gth, Romford.-One mile handicap: S. S. Smith, Essex B.C. (I).

June 3rd, Edinburgh.-One mile handicap: M. Sinclair, Midlothian, 75 yds (1) ; J. P. Robertson, Loretto, ioo (2). Time, 3 m .56 s .
June 17 Th, Edinburgh.-One mile handicap: M. J. Lowndes, Macclesfield, scratch (I) ; J. Hay, C.T.C., I Io yds (2) ; M. Sinclair, C.T.C., ino (3). Time, 3 m .27 s .
June I7th, Widnes.-One mile scratch: W. Dorning, junr., W.F.C. (I) ; G. H. Illston, Royal Mail (2) ; J. M. Fawke, Southport (3). Time, 5 m . $17 \frac{1}{5} \mathrm{~s}$.
June i8th, Clifton.-Two miles handicap: E. Platneur, Redcliff, 250 yds (1) ; H. Robbins, Thornberry, 230 (2) ; E. S. Everett, Bath, 28 o (3). Time, 8m. 20s.
June 2ist, York.-Half-mile handicap: T. R. Marriott, Nottingham, scratch (1) ; J. Fowler, Hull, 20 yds (2) ; H. T. Tomlinson, York, 45 (3). Time. 2m. $12 \frac{1}{3} \mathrm{~s}$.
June 2ist, St. Ives.-One mile handicap: S. S. Smith, Essex B. and T.C., 40 yds (1); H. Exworthy, ioo (2). Time, 3 m .48 s .
June 24th, Edinburgh.- Two miles handicap: J. Hay, junr., C.T.C., 30 yds (I); T. Lamb, scratch (2).

June 24th, Totteridge Common.-Koad handicap of the Finchley T.C. Five miles: P. T. Letchford, i5s. (r) ; A. Young, junr., im. 45s. (2) ; E. Fox, junr., 5 m. 30s. (3). Time, 22m. 30 s.
June 25 Th , Agen.-Two miles scratch: F. De Civry, Paris (I); M. Rousset, Bordeaux, (2); M. Raymond, Bordeaux (3).

July ist, Coventry (Starley Memorial Sports). - One mile handicap: J. Hembrough, Nechells B.C., Io5 yds (I) ; T. A. Smith, Rudge Cyclists, I2O (2) ; M. J. Lowndes, scratch (3). Time, 3 m . 12 s . Three miles handicap : J. Hembrough, 270 yds (1) ; J. H. Ball, 500 (2) ; M. J. Lowndes, scratch (3). Time, Iom. $8 \frac{1}{2} \mathrm{~s}$.
July 6 th, Wisbech.-One mile handicap: T. R. Marriott, Notts., scratch (1); G. A. Beales, Spalding, 100 yds (2) ; H. Exworthy, Biggleswade, 50 (3).
July 8th, Romford.-One mile handicap: G. Smith, Merry Rovers, 120 yds (1); E. Burr, Queen's C.C., 115 (2) ; F. Wiltshire, IIO (3). Time, 4 m . $17 \frac{1}{5} \mathrm{~s}$.
July i2th, Edinburgh.-Two miles handicap: J. Hay, junr., C.T.C., scratch (I) ; G. C. Catheart, 300 yds (2). Time, '9m. 24 s .

July i3th, Rennes.-r 800 metres, scratch: C. R. Garrard, London (1) ; P. Medinger, Paris (2) ; C. Terront, Paris (3).

July i3th, Chichester.-One mile club handicap: G. H. Fogden, scratch ( I ) ; W. R. Billing, 40 yds (2). Time, $4 \mathrm{~m} .34 \frac{4}{5} \mathrm{~s}$.
July i4th, Toulouse.-3,Ioo metres, scratch: F. De Civry, Paris (I) ; M. Berthoin, Grenoble (2) ; H. O. Duncan, England (3). Time, 8 m .15 s .
July 15th, Cardiff.-Two and a half miles club race: G. L. Trefiletti ( 1 ) ; W. H. Hutchins (2). Time 13 m .
July ifth, Sheffield. - One mile handicap: T. R. Marriott, Notts., scratch (r) ; H. M. Pashley, Sheffield, 190 yds (2). Time, $3 \mathrm{~m} .55^{\mathrm{s}}$.
July 27 Th , Eastbourne.-One mile handicap: G. Smith, Merry Rovers, 50 yds (1) ; H. G. Clarke, E.B.C., 70 (2) ; L. L. M. Marsden, B.B.C., 60 (3). Won easily. One mile district handicap: H. G. Clarke, io yds (I) ; T. Knight, scratch (2). Time, 4 m . 26s.
July 28th, Alexandra Palace.-One mile handicap: M. H. Hay, scratch (r) ; W. H. Griffin, 55 yds (2). Time, 4 m .37 s .-One mile club championship: M. H. Hay ( $\dagger$ ) ; E. Burr ( $\dagger$ ). Time, 4 m .34 s .
August 3rd, Cambridge.-Two miles handicap: G. Smith, Merry Rovers ( I ). Time, $7 \mathrm{~m} .33 \frac{2}{5} \mathrm{~s}$.
August 7th, Coventry.-Two miles handicap': M. J. Lowndes, Congleton, scratch (I) ; J. Hembrough, Nechells, 105 yds (2) ; T. Sidwell, Coventry, 200 (3). Time, 6 m .4 Is.
August 7 th , Harrogati.-One mile scratch: T. R. Marriott, Nottingham (I) ; J. Hay, Edinburgh (2), Time, 4m. 35s.
August 7th, Spalding.-One mile handicap: G. A. Beales, Spalding, I 50 yds (1) ; J. Byron, Fleet, Iuo (2). Won by 50 yards.
August 7th, Southampton--One mile handicap: W.E.N. Coston, S.A.B.C., scratch (I) ; F. Haisman, Bedford Place C.C., 40 yds (2). Time, $4 \mathrm{~m} .5^{\text {Is. }}$

August 7th, Taunton. - One mile handicap: W. H. Casley, Exeter, scratch (I) ; F. Parratt, Exeter, Ioo yds (2). Time, $3 \mathrm{~m} .32 \frac{1}{2} \mathrm{~s}$.
August 7 the, Romford.-One mile handicap: G. Smith, Merry Rovers, 30 yds (1); P. T. Letchford, F.T.C., 50 (2); L. Schlentheim, Merry Rovers (3). Won by 40 yds. Time, 3 m .59 s .
August gth, Chesterfield.-Three-quarter mile, scratch: R. H. Phillips, Chesterfield (I).
August ioth, Gloucester.-One mile handicap: J. Hembrough, Nechells, 30 yds (I); W. H. Casley, Exeter, 100 (2); F. Smith, Worcester, 140 (3). Time, $3 \mathrm{~m} .41 \frac{2}{5} \mathrm{~s}$.
August i3th, Grenoble.-Amateur Championship of France: A. Viennet (r).
August 13th.-Professional French Championship : Paul Medinger (1). 2,000 metres in 4 m .34 s .

August ifth, Norwich. - Two miles handicap: H. Griffin, 50 yds (1) ; J. Griffin, ifo (2) ; W. C. Hands, ifo (3). Time, $9 \mathrm{~m} .24 \frac{3}{5} \mathrm{~s}$.
August 23rd, Winchester.-One mile handicap: W. R. Billing, Chichester, 50 yds (I); W. Snook, Winchester, scratch (2); D. F. O. Poulter, 150 (3). Time, $5 \mathrm{~m} .2 \frac{3}{4} \mathrm{~s}$.

August 23D, Mid-Surrey C.C.-Ten miles scratch: Love ( I ); Turner (2) ; Frost (3). Time, rh. 2 m .
Augúst 26 th, Southport.-One mile handicap: T. R. Marriott, N.B.C., scratch (I) ; J. M. Fawke, Southport, 150 yds (2); J. H. Jackson, Southport, 200 (3). Time, 4 m .7 s .

August 26th, Sydney, Australia.-Single Tricycle Race: W. R. George (r). Double Tricycle Race: Messrs. W. H. Lewis and Perdrian (I).
August 28th, Taunton.-One mile handicap: H. Sturmey, Coventry, 200 yds (1) ; W. Reilly, Taunton, 150 (2) ; W. H. Casley, Exeter, scratch (3). Time, 3 m .34 s . One mile handicap (local): W. Reilly, scratch (1) ; F. Ingram, 140 yds (2) ; F. Evered, 150 (3). Time, 3 m .59 s .
September 2nd, Lincoln.-Half mile handicap: E. Bowles, Nottingham, 80 yds (I) ; P. T. Letchford, F.T.C., 85 (2); G. Smith, Merry Rovers, 35 (3).
September 2nd, Southampton.-One mile handicap: A. Richards, S.A.B.C., 160 yds (1) ; W. E. N. Coston, S.A.B.C., scratch (2). Time, 4 m .34 s.
September 2nd, Exeter.-Three miles handicap: W. H. Casley, Exeter, scratch (1) ; F. Parratt, Exeter, 350 yds (2). Time, $72 \mathrm{~m} .28 \frac{1}{5} \mathrm{~s}$.
September 4th, Leicester.-Five miles road handicap: M. J. Lowndes, Coventry, scratch (1) ; T. R. Marriott, Nottingham, 30 secs (2) ; G. Hawkes, Leicester, 3 min 30 secs (3). Time, 18m. 50 os .
September 4th, Exeter.-One mile handicap: W. H. Casley, Exeter, scratch (1) ; F. Parratt, Exeter, 130 yds (2) ; L. Burch, Exeter, 130 (3). Time, $3 \mathrm{~m} .31 \frac{2}{5} \mathrm{~s}$. Five miles championship of Devon: W. H. Casley, Exeter (1) ; F. Parratt, Exeter (2) ; L. Burch, Exeter (3). Time, 1gm. 25s.
September gth, Nottingham.-One mile handicap: R. Cripps, N.B.C., 65 yds (1) ; E. Bowles, N.B.C., ino (2) ; C. W. Bennett, Speedwell, 80 (3). Time, $3 \mathrm{~m} .44 \frac{3}{5} \mathrm{~s}$.
September 9th, Glasgow.-One mile, scratch : J. Hay, Caledonian T.C. (I).

September gth.-Fifty Miles Road Championship: M. J. Lowndes, Congleton (1) ; T. R. Marriott, Nottingham (2) ; W. B. ParkerF.T.C. (3). Time, 3 h. 47 m . 40 s .

September 16th, Cardiff.-Two miles handicap: Miss Jenny Lascelles Carr, Cardiff, i mile 600 yds start (I) ; J. C. Morris, Cardiff, 130 yds (2); G, J. Trefiletti, Cardiff, 50 (3). Time, $9 \mathrm{~m} .2 \frac{3}{4} \mathrm{~s}$.

September i8th, Southport.-One mile handicap: T. R. Marriott, N.B.C., scratch (I) ; J. M. Fawke, Southport, 150 yds. (2) ; J. H. Jackson, Southport, 200 (3). Time, $4 \mathrm{~m} .7 \frac{3}{5} \mathrm{~s}$.

September igth, Leominster.-One mile handicap: F. Smith, Pershore, scratch (1) ; F. G. Blacklock, L.B.C., 60 yds (2); T. J. Anthony, L.B.C., 40 (3). Time, 5m. 25s.

September 2 ist, Huntingdon.-One mile handicap: C. Bryant, Huntingdon (1) ; T. Weldon, Buckden (2).
September ${ }^{25 T h}$, Stockport.-Two miles handicap: R. Cripps, Notts., 260 yds (1); T. R. Marriott, 200 (2); W. S. Willoughby, Stockport, 360 (3).
October 4th, Jersey.-One mile club: Gandin (1) ; Bree (2); Suinatt (3). Time, 4 m . 20s.-Half mile, backwards : Bree ( I ); Scriven (2).
Ocrober 7 th, North London T.C.-Five miles scratch road race: A. J. Wilson (I) ; A. B. Baddeley (2) ; H. T. Whorlow (3).

October i4th, Cristal Palace.-Five Miles Path Championship : C. E. Liles (I) ; H. W. Gaskell (2). Time, Igm. $39_{5}^{2} \mathrm{~s}$.

November 4 th, Walsall.-Ten miles road handicap: F. Moore, Warstone, scratch (I) ; P. Taylor, 6m. (2) ; J. Naddermies, $5 \frac{1}{2} \mathrm{~m}$. (3). Time, 49 m .
November igth, Bordeaux.-International Championship: C. R. Garrard, Coventry (I).

## FASTEST TIMES ON RECORD.

| Miles. |  |  |  | lirs. min. sec. |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | M. J. Lowndes | ... | $\ldots$ | o | 3 | II |  |
| 2 | ,' | ... | ... | 0 | 6 | 28 |  |
| 3 | ", | ... | ... | 0 | 9 | 49 |  |
| 4 | " | ... | ... | o | 13 | 12 |  |
| 5 | " | ... | $\ldots$ | 0 | 16 | $24 \frac{1}{2}$ | Path |
| 6 | , | ... | ... | 0 | 20 | 17 |  |
| 7 | " | ... | ... | 0 | 23 | 43 |  |
| ૪ | " | $\ldots$ | $\ldots$ | 0 | 27 | $25 \frac{1}{2}$ |  |
| 9 | ," | $\ldots$ | $\ldots$ | 0 | 30 | 47 |  |
| 10 | ", | ... | $\ldots$ | 0 | 34 | $3)$ |  |
| 25 | , | $\ldots$ | ... | I | 45 | - |  |
| 50 | , , . | $\ldots$ | $\ldots$ | 3 | 47 | 50 | Road. |
| $190 \frac{1}{4} \mathrm{~J}$ | J. Hawkins, jun. | ... | ... | 24 | 0 | 0 |  |



# THE FIFTY MILES ROAD CHAMPIONSHIP OF 1882. 

(From "The Tricyclist," September 15 th, 1882.)
 OR the fourth consecutive year, a 50 miles race has been held on the road, for the title of Amateur Tricycling Champion, the winner on Saturday last being M. J. Lowndes, of Coventry, a member of the Congleton Bicycle Club. The previous races had resulted in the victories of A. E. Derkinderen (1879), C. D. Vesey (1880), and G. L. Hillier (188I), the last-named holding the "record" for the distance on a genuine tricycle, his time in the 1880 race having been 4 h .14 m . On the present occasion, the improvements which the last two years' progress have made in machine construction enabled the winner to cover the distance in nearly 27 minutes' faster time than the previous record, the total time taken by Lowndes on Saturday being 3 h .47 m .40 s . Five other competitors succeed ed in covering the distance under five hours, for which they won bronze medals ; the second man, T. R. Marriott, of Nottingham, also beating Hillier's record by 23 m .40 s . Both Lowndes and Marriott, being engaged in the tricycle trade, would have been debarred from the competition under last year's rules, but were eligible upon the present occasion, being amateurs according to the definition of the Bicycle Union, under which the competition was held.

A fine, bright morning broke over London on Saturday, and as noon drew near the intense heat was only tempered by the strong breeze which blew from the North, the strength of which made itself felt as we drove our wheels up the Finchley road to Barnet, two miles beyond which the start was to take place. Ganwick Corner is merely the corner at which a narrow bye-road turns off the main road, between Barnet and Potter's Bar, leading, according to the direction-board on the wall of the Duke of York Inn, "to South Mims, Ridge, Elstree, and Shenley." Some 50 yards up this byeroad is a gate, through which is reached a cow-field redolent of hay and animal refuse. This field was the "private ground" from which the start was to take place, the idea being that this course would prevent any obstruction of the highway, and so save the event from collapse through police interterence. As it turned out, even this precaution was unnecessary, not a single constable being visible in the neighbourhood throughout the day; and at no point along the route were any of the competitors troubled by over-zealous guardians of the peace.

Twelve o'clock, midday, was the time fixed for the start, and at that hour some 30 tricyclists, a dozen bicyclists, and two or three carriages containing ladies had assembled at Ganwick Corner, while in the field were the competitors and officials preparing for the commencement of the ride. Fifteen entries were on the card, to which was added the late entry of an unattached competitor; out of the 16 only two-C. Crute, of the Sutton B.C., and H. J. Venables, of the Civil Service B.C.-were absent. The committee consisted of

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Ten minutes after the appointed hour Mr. Larrette despatched on his journey the man who had drawn the first start, and at intervals of one minute the other competitors were sent off, the order of precedence being decided by ballot. The names of the starters, and the times at which they started were, therefore :-

| W. Bourdon, Brixton Ramblers B.C. | $\begin{aligned} & \text { P.M. } \\ & \text { 12.10 } \end{aligned}$ |
| :---: | :---: |
| M. J. Lowndes, Congleton B.C. | 12.11 |
| W. B. Parker, Finchley B.C. | 12.12 |
| B. W. Attwood, West Kensington T.C. | 12.13 |
| P. G. Hebblethwaite, London T.C. | 12.14 |
| E. B. Stroud | 12.15 |
| T. R. Marriott, Nottingham B.C. | 16 |
| T. Whittaker, Thanet T.C. | . 17 |
| A. T. Nixon, London T.C. | 12.18 |
| Geo. Smith, Merry Rovers T.C. | 12.19 |
| L. Grose, Camberwell Rovers C.C. | 20 |
| E. Thorp, London T.C. ... | 12.21 |
| P. Letchford, Finchley T.C. | 12.22 |
| W. Taylor, unattached ... ... | 12,23 |

The last man having got away, nothing was left for the spectators but to adjourn for refreshment and await the return, a gradual reassembling taking place at Ganwick Corner soon after three o'clock. On the road we are informed that Lowndes set off at a great pace, coached by Garrard, the 20 miles professional champion bicyclist, and had passed Bourdon before covering a mile, after which he was never approached by any other competitor, Marriott (coached by Fred Cooper on a bicycle) being his most formidable antagonist. On the return journey Garrard tumbled off his bicycle at 36 miles, leaving Lowndes to make his own pace, only aided by spurting against such stray bicyclists as he happened to pick up. At Ganwick Corner, as $40^{\circ}$ 'lock approached, anxious glances down the road were at length rewarded by the sight of the winner, leaning over in approved "grasshopper" bicycling style, toiling up the hill and into the field, where he lay on the grass for some minutes, considerably distressed. "How would the minute intervals affect the result ?" was now the question, and many watches were held in the hands of the spectators who counted the passage of time elapsing after Luwndes's return; soon five minutes had elapsed, and it was known that Marriott at least was out of it, upon which the first man rode off the ground in search of rest and refreshment. His machine
was a " Coventry Rotary" racer, weighing $48 \frac{1}{2} \mathrm{lbs}$., the 40 in . driving wheel being geared up to 56 in . Lowndes is under 23 years of age, over six feet in height, broadly and well built, and weighs II stones 8 lbs. when riding. He had not slept all the previous night, owing to the pain given him by a gathering in the palm of his left hand, which necessitated his wearing a felt shield during the race. Besides the record for 50 miles, he has made the best times for one mile ( 3 m .16 s .), two miles ( 6 m .46 s .), and five miles ( 18 m .5 os .).

At twenty seconds past four o'clock T. R. Marriott arrived, his full riding time being thus 3 h .50 m .20 s . Riding the famous 42 in . geared-up " Humber" upon which he accomplished the 180 miles ride, he approached the hill easily, appearing to have given up racing, but being beckoned up he spurted in, and finished the fifty miles in 2 m .40 s . longer time than Lowndes.

A long wait took place before the third man arrived, this period of 33 minutes making it beyond all doubt that Lowndes and Marriott had won the first and second prizes respectively. At 4.35 .25 , Parker rode up the hill, fast, but appearing jaded, his mount being the new $50 \mathrm{in}$. " Imperial Cheylesmore," the racing machine built on the lines of the " Imperial Club " roadster.

Nearly five minutes later, Hebblethwaite (who finished second to Hillier on an "Omnicycle" last year), rode in fast and steadily, on a 52 in . "Humber" roadster; and a few seconds before five o'clock Letchford laboured up the hill on a 50 in . "Premier," level geared, but seemed quite fresh when dismounted.

A minute past five, a cheer announced the appearance of Nixon, "covered with dust, glory, and perspiration ;" finishing fast and cheerful, looking brown as a gipsy, and fit as a fiddle. Owing to his rest of several days' duration after his long journey, and to the circumstance that he rode an old high-geared "Premier," instead o his geared-down touring machine, he had been much troubled by cramp, so that he only won his time-medal by a short period.

Bourdon, of Bromley, was the next to arrive, appearing very faint on his heavy "Cheylesmore" roadster, 50 in . level-geared. Having started first, he was just a few seconds over the five hours; but G. Smith, the next to finish, having been the tenth starter, got within the limit, finishing as cool and unconcerned as can be imagined, his machine being a well-worn 52 in. "Humber" racer.

None of the others came within the time-limit, and their arrivals were consequently not noted. Attwood rode a 52 in . "Humber," Stroud a "Cheylesmore," Whittaker a 50 in . "Premier," Grose a "Humber," and Thorp a 50 in . "Premier," while nothing more is known of the late-entering unattached rider, Taylor. No accidents were reported to have taken place throughout the journey, the route taken being from Ganwick Corner through Potter's Bar, Hatfield, Welwyn, Stevenage, Hitchin, and Ickleford, 25 miles oút and back; a hilly but good road, rather sandy in some places. At the turningpoint, a short distance beyond Ickleford, the times of the com-
petitors were taken as under, to which the full times occupied in the ride are added :-

| Rider. | 25 Miles. | 50 Miles. |
| :---: | :---: | :---: |
| Lowndes | rh. 45 m . os. | 3h. 47 m .40 s . |
| Marriott | Ih. 47 m .40 s . | 3h. 50 m .20 s . |
| Parker | Ih. 56 m . os. | 4 h .23 m .25 s . |
| Hebblethwaite | 2h. om. 30 s. | 4h. 27 m .5 s. |
| Letchford | 2h. Iom. os. | 4h. 37 m .55 s . |
| Nixon | 2h. 5 m . os. | 4 h .43 m . os. |
| Smith | 2h. 12m. os. | 4 h .50 m . 10 s . |
| Bourdon | 2h. I3m. os. | 5h. om. $3^{\text {s. }}$ |
| Taylor | 2h. 22 m . os. |  |
| Whittaker | 2h. 25 m .30 s . |  |
| Grose... | 2 h .47 m . 14 s . |  |

Bourdon mistook the termination of the course, by reason of some spectators crowding forward, and slowed down in coming in, so that the officials decided that he was entitled to a time medal.

## REMARKS ON THE RIDE.

The performance of the winner is a remarkable one from many points; first, it is to be noted that he rode a path racing machine weighing $48 \frac{1}{2}$ lbs., a machine on which he would never have ventured to ride, much less race, on the road, had he not known from his path experiences that it was quite strong enough for his purpose. We had some conversation with him, and, as he put it, many said it would break down, but he knew how to ride it, and as a result brought it through without any trouble. The winner is a racing bicyclist, and seeing the good times he has made on the path, it is not to be wondered at that on a machine only two or three pounds over half the weight of the zoinning machine of the previous year, he should easily have beaten the previous "best." But what we want so emphatically to draw our readers' attention to, is the fact noted above, that far from the Road Ride having improved the roadster machine, it is to the path that we owe the successful use on the road of a "Coventry Rotary" of $48 \frac{1}{2}$ lbs., a " Humber" of 6 olbs., or an "Imperial Club" of 6olbs. More path races will doubtless give us still lighter roadsters, and as Messrs. Lowndes and Marriott are practical racing men, and at the same time the former is a practical mechanic, and the latter a member of one of the foremost firms in the trade, we may look for still more rapid advances in this direction. Already in the "Coventry" and the "Humber" we find a marked decrease in weight in the standard pattern, and there is no reason why a rider should carry around with him a dead weight of useless metal, which he can equally well do without. Perhaps the intrinsically best show was made by the second man, T. R. Marriott, on the 52 lbs. "Humber." It must not be forgotten that he is a
tricyclist, and not a bicyclist, that is to say, he has done little or nothing on the "narrow gauge" machine, whilst he has raced a good deal on the tricycle. The machine he rode was built for the path, and after several successes he tried it on the road, and found it quite strong enough for that work. His performance on the 9th becomes little short of wonderful when we consider that his age is 33 , and that the actual winner has thus ten years the advantage of him: for a man of that age to finish within 2 m . 40s. of Lowndes, especially when all the surrounding circumstances are considered, is indeed a creditable feat, and the further fact that Lowndes on the path can give the older man a considerable start and a beating (a result due, of course, to his youth and his bicycle work) speaks volumes in favour of the "Humber" as a roadster machine. The lessons of the ride are valuable as showing the fallacy of the excuses usually advanced in its favour, but of course the event per se is of interest to all riders from certain points of view, yet we believe the interest would be equally great in a path race, with the additional advantage that the weight of the machine would be reduced without the rider having to trust solely to his own judgment as to the strength of his machine, and thus risk a severe accident far away from home on the high road. At any rate the path race is to come off, and we hope to see all tricyclists working together to secure a success. It is more than probable that a record will be made, should the weather turn out fine.

## NOTES ON THE RIDE.

## (From various Correspondents.)

Perfect weather, roads which, though dusty, were on the whole good, and beautiful country, served to make the Fifty Miles Road Race as enjoyable to the competitors as such a hard piece of work could be. The proceedings passed off without a hitch, and the prognosticated police interference did not take place.
Some of the machines ridden were extraordinary, Parker's mount, an "Imperial Club," particularly. It is about as light a frontsteering double-driver as we are likely to see for some time to come: it weighed 52 lbs. ; Hebblethwaite's "Humber," about 6olbs. ; Marriott's " Humber," 52lbs.; Letchford's "Premier," 951 lbs . ; and, although the Finchley trikist thus carried about 43 lbs . extra weight of metal, he was only 15 minutes behind the Finchley bicyclist. Would not the extra weight of metal make more than 18 seconds per mile difference ?

It is worthy of remark, that the first two men to arrive at the winning post on any but specially built machines for racing, were also the first bona fide tricyclists, and both rode ordinary roadster "Premiers."

Bourdon's machine was the heaviest in the race, it having been built extra strong to carry a child's seat at the back. It has been carefully weighed since the race, and, as it stood, it scaled 104 $\frac{1}{2}$ lbs. This rider met with rather hard luck, as it was owing to an unfortunate error that he was not in three seconds before instead of
three seconds after the five hours' limit. An over-energetic official (Teste Bourdon) rushed up to the fatigued rider about ioo yards short of the winning post, with the welcome news that he had earned his medal, upon which, with a thankful expression on his face, Bourdon pulled up, and was then told he had to go a little farther, and he thus arrived at the post three seconds outside the five hours' limit. He naturally objected, and the too energetic gentleman afore mentioned being interrogated, accordingly told the tale, and the conference committee very properly decided to give the coveted medal to the rider.

Whittaker, of the Thanet T.C., is 58 years of age, and he covered the 50 miles in 5 h . 30 m ., a splendid performance for a man of his years.

The thanks of all the competitors are due to the gentlemen at Welwyn and Stevenage, who offered light but welcome refreshment to the riders as they passed.

Nixon's performance was quite good enough for a man who had just finished such a ride as his " 1,007 miler." It is a well-known experience with racing men that a long ride on the road makes them slower, and we hardly thought Nixon would ride up to his last year's form as to pace. At any rate, the L.T.C. flyer does not need to win any championship to place his name amongst the record makers of the year 1882 .

Another correspondent furnishes us with the following notes :-
The arrangements were very good, and worked out well. In one or two cases, however, the marshals, from not knowing the men personally, were at a loss to get at their numbers.

The knowing ones were not far wrong in their idea as to the probable winner, as Lowndes was spoken of on all sides as almost certain to win. He looked thoroughly fit at the start.

Garrard, the 20 miles professional bicyclist, who coached him, appeared to have had enough of it ten miles from the finish. The way Lowndes romped up the hill out of Welwyn was worth seeing.

It is worthy of note that both the first and second men were looked after by professional bicyclists, as Mr. Marriott had Fred Cooper to attend him over part of the course.

Marriott rode very steadily and well, and made up a lot of time on the return journey; the little 42 in . "Humber" appeared to run splendidly, and the gearing up (to 57 in .) did not appear to affect its hill-climbing powers.

Parker surprised those who did not know him, but men who recollect him as an old bicyclist know his speed and gameness. He was most admirably coached by his old friend, Mr. Egbert Tegetmeier.

Our old antagonist, P. G. Hebblethwaite, rode as pluckily as ever, and, as he had no coach, is to be congratulated on the position he attained.

Letchford, who for half the distance was attended by a well-known bi-tricyclist, rode with great judgment throughout, and keeping up a steady pace of eleven miles an hour, had passed four of his opponents
before reaching the top of Digswell Hill. His well-sustained and plucky spurt to overtake Nixon, whom he caught at Gobion's Well, was worth seeing.

Nixon appeared to ride stiffly, as if he had not quite got over the effects of his late tremendous journey. He evidently enjoyed his ablutions in the horse-trough at the top of Digswell.

Bourdon is to be greatly congratulated on the way he stuck to his work when, evidently, Nature was overdone, and we are very glad he is to have a medal. The crowd at the finish certainly lost him more than the three seconds he was behind the standard.

## THE PATH CHAMPIONSHIP.--October 14th.

(From "The Tricyclist.")

5HE above contest, successfully run off at the Crystal Palace on Saturday, October 14th, excited the very greatest interest amongst wheelmen generally, and we were pleased to see a strong contingent of the Conference men present, and also to note that several bodies of wheelmen turned up to see the race. The general opinion seemed to be that Lowndes must inevitably win, and that the interest of the contest would rather lie in the heats leading up to the final. We must confess that the reports that reached us of the doings of Lowndes rather favoured that view, and we were at one with the general public in anticipating his victory. We the more confidently asserted that 16 minutes would be approached, because we knew what Liles was doing, and we felt sure that, if the Congleton man meant to beat him, he would have to put in a very fine performance. We were very doubtful of Liles's ultimate success, as we did not consider that he had had sufficient practice with the machine he not riding it because he feared it might interfere with his bicycle, riding in the L.A.C. sports.

The wonderfully good entry of 18 was secured for the race under notice, and every important club was represented in the ranks of the competitors, whilst a thoroughly representative body of officials undertook the various duties in connection with its successful management. These were as follows :-Judge, G. Lacy Hillier ; Vice, W. B. Tanner (who undertook the very difficult duties of dressing-room official and general superintendent of the competitors) ; Starter, W. Pye-English; Umpires of Riding and Referees, Messrs. S. P. Smith (London B.C.), H. J. Bell (West Kensington T.C.), A. R. Sheppee (Hornsey B.C.), E. H. Poole (Finchley T.C.), R. P. Hampton Roberts (Belsize B.C.), A. Young (Finchley T.C.), G. C. Locket (B.U. ard T.A., and B.T.C.), Geo. Beeson (Wanderers (B.C.), W. J. Nicholson (Temple B.C.), Jan Bos (Canonbury B.C.), Geo. Redwood (Finchley T.C.); Laptakers, A. Prout (Hornsey B.C.), Henry S. Staples ; Timekeepers, G. Pembroke Coleman (official handicapper and timekeeper to the

Union), Geo. Atkinson (Sporting Life) ; Managing Committee, W. Pye-English, A. R. Sheppee, G. Lacy Hillier ; Manager for the day, G. Lacy Hillier (Stanley B.C. and Finchley T.C.).

In consequence of the large entry, a very early start was necessary, so that at $\mathbf{2} .30$ p.m. a commencement was made with the

FIRST ROUND.
First Heat.-S. S. Smith was unfit, and did not start, so M. J. Lowndes and F. G. Dray met. Little description is needed, as Lowndes shot straight away, and, after lapping Dray-who had done little or no work on the path on his machine-came away in the last lap, and won anyhow in $18 \mathrm{~m} .49 \frac{3}{5} \mathrm{~s}$.

Second Heat.-H. Campion was non est, and Lewis Grose, although present, was short of work and unfit, so did not start. H. Gaskell was, therefore, indulged with a walk over, and, strange to say, accomplished the fastest time in the first round for the distance.

Third Heat.-J. Hembrough did not answer to his name, so P. T. Letchford and Gustav Schulz met. The latter rode a roadster "Fleet," whilst the Finchley man rode a light racing "Imperial Cheylesmore," and ultimately won easily in 19m. $50 \frac{3}{5} \mathrm{~s}$.

Fourth Heat.-E. B. Stroud did not show up, so C. E. Liles and C. W. Coe met, the latter riding a rear-steering "Cheylesmore," and Liles a "Humber." Coe made a very good show, but Liles, though saving himself as much as possible, won easily in the end by twenty-five yards, in 18 m .55 s .

Fifth Heat needs little description, as G. Smith did not show up, through illness, and Woodhouse, on an "Imperial Club," made all the running from Marriott for the first two miles or so, when the " Humber" man went by, and the L.T.C. man, tiring to nothing, gave up, and Marriott finished at his ease in igm. 45s.

Sixth Heat.-W. H. Casley telegraphed from Exeter that he was in bed by doctor's orders, and J. G. Smith not showing up, " John-o'-Groat's to Land's End Nixon" was indulged with a walk over, which he did in $19 \mathrm{~m} .34 \frac{4}{5} \mathrm{~s}$., amid the applause of his friends.

SECOND ROUND.
The fastest loser in this round was entitled to run in the third round, to avoid a bye. Each second man's time was carefully taken.

First Heat (Lowndes v. Gaskell).-Gaskell cut out the running at a very fast pace, and Lowndes was contented with the back seat until entering the 4 th mile, when he dashed by with a well-timed spurt. Gaskell was not done with, however, and, riding strongly, drew up and challenged in the last lap. At this point Lowndes's steering became very doubtful, and Gaskell had to back-pedal to avoid an accident. This occurred three times in the last lap, and Gaskell-who, if he had had a fair run, was undoubtedly going faster than Lowndes-was defeated by two yards, very decided disapprobation of Lowndes's riding being expressed by the spectators. Time, $17 \mathrm{~m} .56 \frac{3}{5} \mathrm{~s}$.

Second Heat (Liles v. Letchford).-Letchford made all the running at a steady pace until nearing home, when Liles burst away and won easily by 120 yards, in 18 m .33 s .

Third Heat (Marriott v. Nixon).-Marriott cut out the running for a short time, when Nixon went to the head of affairs on sufferance, the Nottingham man coming by in proper time, and winning a good race by ten yards, in 19 m . II $\frac{3}{5} \mathrm{~s}$.

Note.-Gaskell protested against Lowndes for foul riding, and on the report of the umpires, stationed at those points of the track where it was alleged the foul took place, the judge would have had no option but to disqualify the Congleton man. On this being explained to Gaskell, he, in a most sportsmanlike manner, withdrew his protest, preferring to take his chance of beating his opponent in a fair race to disposing of him by exercising what was undoubtedly his just right. Gaskell was entitled to run as fastest loser in the third round.

## THIRD ROUND.

First Heat (Liles v. Lowndes).-Lowndes, on his " Coventry Rotary," started at a tremendous pace, covering the first mile in 3 m .22 s .; but the friends of the L.A.C. man were glad to see him wake up and nold the provincial giant with apparent ease. At the commencement of the second lap from home Liles took a feeler, and Lowndes put his best foot foremost, dashing off at a grand pace, but just going on to the second causeway Liles came with a tremendous spurt, and keeping it up in a most determined manner, fairly beat the Congleton flyer for pace, and there was scarcely daylight between them when, to every one's surprise, the latter man sat up and did not even finish the last lap. As the bell rang, Liles, quite oblivious of the defeat of his opponent, dashed away, showing a fine turn of speed, and the public, who had expressed their opinion of Lowndes's riding in the first heat of the second round, gave Liles a tremendous reception as he dashed over the tape in $17 \mathrm{~m} .3 \mathrm{I}_{5}^{2} \mathrm{~s}$. Best on record.

Second Heat (Gaskell v. Marriott).-Marriott, whose chance lay in cutting down his opponent, made all the running, but when the pinch came the older man had to yield the pas to his younger opponent, who won cleverly in 18 m . 19 ${ }_{5}^{2} \mathrm{~s}$., both men coming in for a demonstration of popular favour for riding so good a race.

The heats were run off exactly to time, and an interval of thirty minutes took place to allow the men to get thoroughly rested. Opinion generally favoured Liles's chance, as he had done the best time of the day, and had, moreover, a reputation as a better stayer than Gaskell; and as both had had pretty severe runs, the value of staying power was, of course, not to be under-estimated. At 5-30 the men turned out for the

Final Heat (Liles, London A.C., v. Gaskell, Ranelagh Harriers). -To a good start Liles got away from the inside with the lead, which he held for a mile, when Gaskell went by and cut it out at a grand pace, considering the work he had gone through. Three laps from home Liles caught Gaskell napping, and took the lead and
was soon some yards to the good, but the Ranelagh Harrier, riding with rare pluck and determination, was not to be cenied, and soon caught Liles, and even challenged for the lead, and for a moment it looked as if "Charley" had made his effort too soon. When the bell rang, however, Liles still had the best of the position, and dashed off with a fine spurt. Gaskell, with equal determination, held his place, but was unable to improve it, and Liles won all out by seven yards. Time, 19m. 3 s .

## REMARKS ON THE RACE.

We are confident that the best man won, and the tremendous nature of the test will be gathered from the times of the latter heats. Liles stayed better than Gaskell, who said the four five-mile heats were too much for him.

The thanks of every cyclist-nay, every sportsman-are due to Gaskell for his generous and gentlemanly conduct in the matter of his protest against Lowndes. In the opinion of five out of the six umpires who saw the foul riding against which Gaskell so properly protested, it was avoidable, and had that evidence been formally submitted to the judge he would have had no option but to disqualify the Congleton rider. Gaskell was then interviewed, and the position explained to him: he was informed that he was entitled to run in the third round as fastest loser, and that if he maintained his protest -which by every rule of sport he was most fully entitled to do-his presumably most dangerous opponent, Lowndes, must inevitably be disqualified. At the same time it was added that, although he had every possible right on his side to take that course, yet, having all things in consideration, it would be a most chivalrous action on his (Gaskell's) part to withdraw his protest, and to his honour be it recorded he immediately did so-a most sportsmanlike action, and one which deserves the fullest recognition from ali riders of the wheel.

We recognised a number of well-known faces amongst the spec-tators-Messrs. Baker and Thornton, of the Finchley; the two Salmons, of the London T.C.; C. W. Nairn, with his arm in a sling ; C. D. Vesey, on a "Facile;" Mrs. and Mr. Choice, and the Misses Choice, and many more well-known cyclers; in short, a very representative gathering. Amongst the press men we noticed H. C. Larette, the "Coventry Rotary" rider; Henry Sturmey, up from Coventry to see some of the Coventry men drop that 4 to I on Lowndes, which report says was laid in the City of Spires; C. Cordingley, junr., and many more well-known wielders of the reporting stylus. In short, the press was well represented in the box set apart for their use, which, however, is well contrived for giving anyone a bad cold, as it is so very open to the weather. Mr. Venables was most energetic with the telegraph board, which is of such assistance to the public, whilst we must not omit another word of praise to Charley Wilson, for the splendid condition in which he had got the path for the contest-it left absolutely nothing to be desired. We need only add that there was little wind and no rain, although the
heavens threatened considerably. The wisdom of Gaskell's course became apparent in the first heat of the third round, in which Lowndes suffered defeat at the hands--or rather, we should say, the head-of Liles; for good judgment, combined with pluck and determination, won the race. Lowndes started at a tremendous pace, with the evident intention of, if possible, running Liles out. For a moment it seemed as if his tactics would prove successful, as Liles did not seem inclined to hurry; but as soon as he saw what the Congleton man was at, he started in right good earnest, and when Lowndes looked round, after a tremendous set-off, he saw the impassive visage of the ex-Temple B.C. man dead on his back wheel. This seemed to disconcert the Midlander but little, for he laid himself down to his work in fine style, riding at a fast and steady pace, and going with great apparent ease. Liles spun along in good form, but he did not steer nearly so well as Lowndes, doubtless because he had only had such a very short training on the machine. So matters progressed until two laps from home, when Liles took a feeler on the first causeway, which set Lowndes going hard. Liles, however, was working out a set plan, for just before getting to the second causeway, he came with a tremendous rush, and beating Lowndes fairly for pace, got clear, though not more than a couple of yards' daylight was visible. Then, amidst a cry of surprise from the crowd, the big man "chucked it" most unmistakably, and did not even finish the final lap. In the meanwhile, "Charley Liles," without turning his head, was spurting in magnificent style round the track, showing how little distressed he was by the rapidity of the pace, and he dashed over the tape a most popular winner, having covered the five miles in 17 m . $31 \frac{2}{5} \mathrm{~s}$. ; best on record. Liles's mount was a "Humber" racer, the same machine, we believe, on which Marriott did so well in the road ride, which was originally built for the path, and was, after a good testing on the path, ridden in the road contest. So, also, Lowndes's machine was an exact copy of his "road ride" machine, which was originally built for the path, and on which he has done part of his training for the Palace contest. Liles's machine weighed about $501 b s$. , Lowndes's about $481 \mathrm{bs} .$, and Gaskell's about 461bs.

It should be noted that Gaskell in his walk over made the best time of the first round, which showed how much the men were saving themselves for the final rounds. This rider was most amusing in his remarks, thus when starting in the second round with Lowndes he requested him to "hurry up," because he (Gaskell) wanted his silver medal; so also in the heat in the third round, in which he met Marriott, the latter started off at score, and Gaskell, whilst going after him, remárked aloud, "Oh, what a demon at starting!" whilst in the final his request to the press box that some one would "put a bit on Liles" for him, elicited some laughter.

In fact, but for the "protest episode," all went as merry as a marriage bell, and the friendly way in which the men conversed about their chances in the dressing room was not the least pleasing feature of the day. Gaskell thought he would not win the final, as
the terrific work of the three preliminary heats had told their tale; they, however, did not prevent the Ranelagh Harrier running down to Ripley the next day on his bicycle, with an extension after dinner to Guildford.

Of the road riding division Nixon and Letchford made the best show, but these riders cannot expect in a race, whether on a path or on a road, to stick to men who, at a pinch, can move their legs. half as fast again ; in fact, the whole gist of the matter lies in the fact that the long distance road riders absolutely slow themselves when they undertake the long jaunts they so much favour. The only wonder to the experienced racing man is how they can retain elasticity enough to do the times they succeed in doing.

Marriott, considering his age, made a grand show, and it was nowonder that he suffered defeat at the hands of the sprinter, Gaskell, just as he, from his path experiences, was able to hold and play with Nixon when the final of their heat came.

The final was a sight to be remembered, although the gathering darkness made the obtaining of that sight rather a difficult job. But there was no waiting in the contest, both men had had some stift struggles, and both were trusting to the chance of the other "cracking." Gaskell did his level best to run Liles out, and when, after getting forty yards to the front, three laps from home, Liles ca me steadily back to Gaskell, until the latter actually challenged him for the lead, it looked to those who could see as if Liles had got to the end of his tether ; but if Liles was pretty well done with, Gaskell was in no position to take advantage of the fact, and when the bell rang Liles was in front, and keeping the machine moving at a grand pace, he just about maintained his distance from the "Cheylesmore" jockey, and won, all out, by seven yards.

We are quite satisfied that the best man won, and we think that the plan of clocking each individual second man, and permitting the fastest of them to run in the third round, was wisely adopted, as by that means Gaskell became the runner-up for the 1882 championship. Were we asked to place the men on their form of Saturday, we should say that, all things being equal, and a fair course obtainable, the result would be-Liles (1), Gaskell (2), Lowndes (3), Marriott (4). Lowndes is, undoubtedly, a very fine slogger, but he fails in finish, and if either Liles or Gaskell were with him 300 yards. from home, he would be beaten. Whilst we see that he could not shake off Liles on Saturday, it is therefore clear that the "funk" which has been established by the "Congleton flyer" this season is not a well-founded one, and that if some of our tricycle racing men will lay themselves out to acquire a little finish, they may yet turn the tables on the hitherto invincible "Coventry Rotarist." Certainly, his exhibit:on on Saturday suggests anything but that dash and courage that is so requisite in a successful flyer. In contradistinction to Liles's somewhat imperfect mastery of the steering of his mount, the riding of that experienced "Humberite," Marriott, was. noticeable for its accuracy-in fact, the machine, although a new one to him, seemed as much a part of its jockey as the bicycle of an
accomplished rider, and he certainly showed up well in the contest. We fancy that Nixon is Marriott's senior, but we are certain that these two were the oldest men in the race. Every important club was represented in the race, and we hope to see this contest take foremost rank as the tricycle championship in future. The number of daily papers which published full reports of the contest was a remarkable feature in the affair. To our own knowledge, the Times, Daily Telegraph, Daily Chronicle, Morning Advertiser, Sportsman, Sporting Life, and Standard contained reports of the race, all but the Times falling into the error of ascribing to Lowndes the fastest time of the day, instead of the fastest losing time. But the Times fell into the more serious error of asserting that Gaskell withdrew his objection, or protest, because he "felt sure the foul riding was accidental." This was not so. Gaskell, as pointed out above, withdrew his protest solely because he knew that, if he maintained it, his opponent, Lowndes, would inevitably be disqualified; and having that option at his disposal, he preferred to take his chance of beating his man than to take advantage of his undoubted right to remove him without trouble from the competition.

Altogether we may pronounce the championship of 1882 to be an unqualified success.

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## ESTABLISTIET 187\%.

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TRICYCLE CLUB DIRECTORY.

| NAME. | HEAD-QUARTERS. | CAPTAIN. | HON. SECRETARY. | UNIFORM. | $\begin{aligned} & \text { NO. OF } \\ & \text { MEM- } \\ & \text { BERS. } \end{aligned}$ | $\begin{aligned} & \text { WHEN } \\ & \text { FORMED. } \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Albert | Portsmouth |  |  |  |  | 1882 |
| Aliiance . | Willoughby Arms, Teddington | G. S. Horsley | Z. J. Allnutt, Wolsey Road, Teddington | Dark blue | 13 | 24 Aug., 1881 |
| Alton | Alton, Hants .. . | R. Andrews | R. Baldwin |  | 14 | 1 June, 1882 |
| Atalanta | Manchester | F. Sellon | Smith | Greon plush |  | 1883. |
| Belsize | Swiss Cottage Skating Rink | M. M. Marsden. | W. Spyer, 7, Belsize Park Garde as, N.W. | Brown . | 19 | Oct., |
| Brighton | 87a, Church Street | (The President) | F. M. Har |  | 20 | Jan., 188 |
| Birmingham | Horse Fair Restaurant | II. Morley | C. F. Rodway, 18, Bristol Street, Birmingham | D'k. heather mixture | 30 | 24 May, 1882. |
| Cardift | - - | G. Best | Burrows .. ... |  |  | Sept., 1882. |
| Caledonian | Edinburgh | R. Strang | Drummond, Castle Strest, Edinbursh | Grey | 43 | 4 May, 1882. |
| Cheylesmore .. | Coventry |  | - - |  |  | 1881. |
| Ealing and Acton |  | W. T. Davey | N. C. Hadley . . |  | 30 | 1883. |
| Eastbourne | New Hall, Seaside Roal | C. Clark.. | T. Atkins, 13, West Terrace | ark blu | 20 | 1 Aug., 1882. |
| Edgbaston | Birmingham | R Thornton |  |  |  | 1882. |
| Finchley | Finchley | R. Thornton | B. ReJwood, Fair Lawn, North Finchley | Grey | 45 | 16 Apl., 1880. |
| Forest Hill and Sydenham |  |  |  |  |  | 1883 |
| Glasgow.. | Pullokshields | W. W. Logan | J. Macrae, 24, Geor se Square, Glasgow.. |  | 19 | Oct., 188 |
| Gloucester | Spa Pump Rooms | F. W. Fisher | C. Robins, junr., Dunkerque House, Southgate Street | Dark blue | 42 | $3 \text { Aug., } 1880 .$ |
| Huddleston |  | - | - - | - | - | ct., 1882. |
| Heathfield | Handsworth |  |  | - | - | June, 1882. |
| Jersey |  | J. Forster, junr. | reet |  | - |  |
| Kensington Park | - - |  | op, 49, Luke:s Road |  |  | Nov., 188 |
|  |  |  |  |  |  |  |
| Liverpool <br> London . |  | Elected each run A. Howard | E. Harriman, 138, Brownlow Hill | Dark blue . | $\begin{array}{r} 24 \\ \hline \end{array}$ | May, 1882. |


| NAME. | HEAD-QUARTERS. | captan. | hon. Secretary. | UNIFORM. | $\begin{gathered} \text { NO. OF } \\ \text { MEM- } \\ \text { BERS. } \end{gathered}$ | $\begin{aligned} & \text { WHEN } \\ & \text { FORMED. } \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Merry Rovers | Walthamstow | L. Schlentheim. | A. Frankland, Hope Villas, Waltham tow W, B. Jackson, 34, Grey St., Newcastle- | Brown | $\begin{aligned} & 20 \\ & 45 \end{aligned}$ | April 12, '82. May 12, 1882. |
| Newcastle |  | Dr. Green | W. B. Jackson, 34, Grey St., Newcastle-on-Tyne | - | $45$ | May 12, 1882. |
| North London | Rectory Road Station, G.E.P.; and Manor H use, Finsbury Park | A. J. Wilson | T. Britten, 11, British Street, Bow | ark blu | 53 | Aug. 1, 1882. |
| Peterborough |  | Goodman | - Neale | - | - | 1883. |
| Reading.. |  | C. B. Tubbs | W. Soper |  | 0 | Sept. 6, 1882 |
| Rotherham |  | C. H. Moss | E. J. Hubbard, Moorgate St., Rotherham | Dark blue | 9 | 1881. |
| South Devon | Guildhall Square, Plymouth |  | J. J. Garland, 3, Princess Square, Ply mouth |  |  | May 22,1832 |
| South London | Loughborough Junction | (Vacant).. | T. G. Ackland, 44, Dalberg Rd., Brixton | Brown | 80 | May 22, 1832. |
| Southsea | Castle Hotel | J. G. Smith | U. G. Knight, 12, Queen's 'Jerrace | Dark grey | 30 | Oct. 5, 1882 |
| Taunton.. | Sheaf, St. Peter |  | Rutt, Laurel House, Broadstairs |  | 18 | $\begin{aligned} & \text { 1882. } 2.3, ~ ' 81 . ~ \end{aligned}$ |
| West Kensington | Queen's Head, Brook | W. Elton | W. W. Williams, 33, Purcell Crescent, | Dark blue | 30 | Oct., 1880. |
| West Middlesex | Green .. ${ }_{\text {Prer }}$ Hotel Chelsea | W. Cowley |  | Dark b | 20 | May 5, 1882. |
| Wirral .. | Birkenhead .. | T. A. Lowe | A. Shackleton |  |  | 188 |
| Worcester Foreign. | Bell Hotel | J. F. Santonna | F. Moore, Woodland View, Red Hill | Dark blue | 24 |  |
| Alpha .. | West Newton, Mass., U.S.A. | - | - - | - |  | July 11, 1882 |
| Boston .. | Boston, U.S.A... | - | - - | - | - |  |
| Newhaven Wilner | Newhaven, U.S.A. Hotel Victoria, Vienna | - | A. Curjel, 4, Favoriten Scrasse | - | - | $\begin{aligned} & \text { Oct. 15, } 1881 . \\ & 1882 . \end{aligned}$ |

[^4]
## DIRECTORY OF MANUFACTURERS.

| name. | ADDress. | machine. |
| :---: | :---: | :---: |
| Alldridge, A. H. .. | King Edward's Works, Edward Street, Parade, Birmingham | King of the Road |
| Allport, S. B. | 50, Whittall Street, Birmingham .. | Transport. |
| Alpe Bros. | Baker Street, Hull |  |
| Arrow Tricycle Co. | Wa $\ddagger$ son Street,Stoke Newington Green, London | Arrow. |
| Ash, G. W. \& Co. | 13, Russell Street, Portsmouth | Lea |
| Bayliss, Thomas \& Company | 80, Lower Ford Street, Coventry | Excelsior. |
| Beech, James | Gladstone Works, Wolverhampton | Advance. |
| Bicycle and Tricycle Sale Rooms C... .. | 57, Chancery Lane, London, W.C. .. | Sutton. |
| Bicycle and Tricycle SupplyAssociation | 27, Holborn Viaduct, London, E.C. | Omnicycle. |
| Bicycle and Tricycle Supply Co. | 21, Princes Alley, Wolverhampton | Allegro. |
| Birmingham Small Arms Co. | Small Heath, Birmingham | Delta. |
| Blenheim \& Son | New Egham, Surrey | Englefield. |
| Bricknell \& Co. | Merlin Engineering Works, Brixton Rise, London | Merlin. |
| Broadbent Cycle Co. | Hurley Road, Lower Kennington Lane, London, S.E. | Omnimotor. |
| Burnett \& Co. | Hunslet New Roads, Leeds . . | Leopold. |
| Burdess, Adam | Holyhead Road, Coventry .. | Sterling. |
| Bullock, J. \& Co. | 280, Broad Street, Birmingham | Speedwell. |
| Carey Bros. | 1, St. Andrew Street, Dublin | Dublin. |
| Caroche Tricycle Co. | Jordan Well, Coventry | Caroche. |
| Centaur Cycle Co.. | West Orchard Works, Coventry | Dual Conv'tible. |
| Charnwood Tricycle Co. | Loughborough .. .. | Charnwood. |
| Clarke, Henry .. | Cogent Works, Darlington Street, Wolverhampton | Cogent. |
| Cotterill, Samuel | Wolverhampton .. | Onward. |
| Coventry Machinists' Company | Cheylesmore, Coventry .. | Imperial Club. |
| Coventry Phœnix Tricycle Co. | 134, Much Park Street, Coventry | Phœnix. |
| Cox. J. \& Sons | Railway Road, King's Lynn | Sandringham. |
| Dalby, J. P. | 3, Whitehall Road, Leeds | Dalby. |
| Devey, J. \& Son | Tower Works, Wolverhampton | Express. |
| Denne \& Co. | Station Street, Sittingbourne, Kent | King of the Road |
| Desideratum Bicycle Company | Stewart Street, Wolverhampton | Desideratum. |
| English Cycle Co. | Cradley Heath, Birmingham .. .. | Alaska. |
| Gadsby, E. | 24, Bearward Street, Northampton | Northampton. |
| Gwinnett, A. \& Co. | 6, Alma Street, Wolverhampton ... | Essential. |
| Harrington, J. \& Co. | Enamel Works, Much Park Street, Coventry | Arab. |
| Hickling \& Co. | Queen Street, Maidenhead ... .. | Pilot. |
| Highbury Machine Co. | 33, Holloway Road, London, N. | Nerno. |
| Hill \& Morton | Trafalgar Works, Upper Well Street, Coventry | Arion. |


| AME | ADDRESS. | Iachine. |
| :---: | :---: | :---: |
| Hillman, Herbert and Cooper | Premier Works, Coventry | Premier. |
| Hough, Thomas .. | Mander Street, Penn Road, Wolverhampton | Florentine. |
| Howe Machine Co. | Bridgeton, Glasgow | Howe. |
| Hughes, George | Temple Street. Wolverhampton | M |
| Humber, Marriott, and Cooper | Beeston, near Nottingham .. | Humber. |
| Laxton \& Simmons | Britannia Works, Jordan Well, Coventry | Britannia. |
| Leicester Tricycle Company | Station Yard, Leicester . . . . . | Leicester Safety. |
| Lewis, W. | Tempest Works, Cleveland Road, Wolverhampton | Condor. |
| Lewis, W. G. \& Co. | Speedwell Works, Romford, London .. | Speedwell. |
| Lloyd Bros. | Harborne, Birmingham | Quadrant. |
| Lloyd, Samuel | Church Lane, Wolverhampton | Highland Mariy |
| Manchester Tricycle Co. | 14, Exchange Arcade, Deansgate, Manchester | Dreadnought. |
| Markham, Arthur | 345, Edgware Road, London | M |
| Maynard Harris and Co. | 126, Leadenhall Street, London | al Devon. |
| Mercury Machinists' Co. | 5, 6 | Greyhound. |
| Metropolitan Machinists' Co. | Bishopsgate Street Without, London, E.C. | Gnat. |
| Midland Machinists' Co. | 88, Great Charles Street, Snow Hill, Birmingham | Flying Eagle. |
| Monarch Tricycle Co. | John Bright Street, Birmingham | Monarch. |
| Moore, Thomas | The Horns, Kennington Park Corner, London | Orbicycle. |
| Morris Bros. | 16, Angel Street, Cardiff | Cambrian. |
| National Bicycle Co. | Spon Street, Coventry | at |
| NottinghamTricycle Co. | Hockley Mill Works, Nottingham | NottinghamTel escopic. |
| Overman Wheel Co. | Courant Buildings, Hartford, Conn., U.S.A. | Victor Rotary. |
| Parr, J. | Navigation Street, Leicester | Star. |
| Pashley, H. M. | London Road, Sheffield. | Indispensable. |
| Patrick, Henry \& Co. | 47 \& 48, Darlington Street, Wolverhampton | Emperor. |
| Pausey, H. J. | Bedford Road, Clapham, London | Pioneer. |
| Phillips, A. | Excelsior Works, Rea Street South, Birmingham | Wolseley. |
| Plowright, J. | 27, Railway Road, King's Lynn | Lynn Expres |
| Pope Manufacturing Co. | Boston, Mass., U.S.A. | Columbia. |
| Royal Machine Manufacturing Co. | Herbert Road, Small Heath, Birmingham | yal Mai |
| Rucker, M. D., Junr., and Co. | Letchford's Buildings, Bethnal Green Junction. London | Rucker. |
| Rudge \& Co. . . | Crow Lane Works, Coventry .. | Coventry Rotary. |
| Safety Cycle Co. | St. Paul's Square, Bedford | Rambler. |
| Seed, S. \& Son | High Street, Railway Road, Blackburn | Seed. |
| Settle \& Co. | Fleet Works, Fleet Street, Coventr | Fl |
| Singer \& Co. | Challenge Works,Alma Street, Coventry | Apolla. |
| Smallwood \& Co. | Union Mills, Foleshill, Coventry | Hero. |


| name. | ADDRESS. | machine. |
| :---: | :---: | :---: |
| Smedley \& Green | Arkwright Street, Nottingham | Flying Dutchman. |
| Smith, Thos. \& Sons | Saltley Mills, Birmingham | Empress. |
| Snow, C. | Birkbeck Road, Kingsland Rd., London | Birkbeck. |
| Soper, W. | 22, Friar Street, Reading | Berkshire. |
| South London Machinists' Co. | Suffolk Grove, Great Suffolk Street, Southwark, London | Eclectic. |
| Sparkbrook Manufacturing Co. | Much Park Street, Coventry .. .. | Sparkbrook National. |
| Starley Bros. .. | St. John's Works, Fleet Street,Coventry | Royal Salco. |
| Starley and Sutton | Meteor Works, West Orchard, Coventry | Meteor. |
| Stassen, J. \& Son | 251, Euston Road, London | Nonpareil. |
| St. George's Foundry Co. | Pope Street, Birmingham | Diana. |
| Thresher \& Sims | 8, Wells Terrace, Stroud Green Road, Finsbury Park, London, N. | Victoria. |
| Timberlake, Thos. \& Co. | 39, King Street, Maidenhead, Berks. | Timberlake. |
| Toledo Steel Co. | Ryland Road, Kentish Town, London. | Volante. |
| Townend, G. | Wellington Works, Hill Fields, Coventry | Wellington. |
| Upton, J. H. | Jumbo Works, Ventnor, Isle of Wight | Jumbo. |
| Walters, J. F. | 47, Queen's Road, Bayswater, London, W. | Iroquois. |
| Ward, A. H. | Cross Street, Smethwick | Aolus. |
| Warman, Laxon and Youett | Albion Mills, West Orchard, Coventry | Victoria. |
| Weatherill, H. | 33, Beech Street, Hightown, Manchester | Weatherill. |
| Weston, D. G. | 38, Myddelton Street, London | Weston. |
| Wolverhampton ManufacturingCo. | Waterloo Road North, Wolverhampton | Curret. |
| Wootton, G. .. | 4, Gwyn Street, Bedford | Bedford. |
| Zephyr Tricycle Co. | Lower Ford Street, Coventry .. .. | Coventry Zephyr. |

## ADDENDA.

 HIS contains several illustrations which were not ready in time for insertion with the description of the articles or machines they represent, as well as details of novelties and new machines which came to my notice, or were introduced after the commencement but before the completion of this volume.

The Cambrian Adjustable Spring is somewhat on the same principle as the Cradle. Constructed of a square steel bar, its shape is best seen by reference to the appended cut. Its chief feature, is that by shifting the position of the holders $\mathbf{B}$, it is rendered more or less pliant according as the holders are moved forward


THE CAMBRIAN ADJUSTABLE SPRING.
or backward, and by this means it may be adjusted to suit the weights of different riders.

Broadbent's Non-vibrating Spring Head is fitted to a rear steering tricycle, and consists in mounting the backbone centres on a stout coiled spring placed within the barrel of a Stanley head, so that the whole weight of the rear part of the machine rests on this spring, and thus reduces vibration to a minimum.

Lamplugh's Eclipse Saddle is "positively the latest out" in the saddle line, and promises to be as great a success as the "Longdistance" of the same firm. It is built on the suspension principle, and is the same in size as the tricycle suspension saddle. It is softly padded, and has a central groove along the top. The sides are flexible and "give" on all points, but the chief feature is its adjustability, for it is so made that should it give in the centre it can be "taken up" by the rider in a few minutes.

The Dalby Folding Frame has a peculiarity over all others in that by its use not only is the width but the length of a tricycle reduced. The general plan of the machine is rear steering with open front, the frame being of the "square-backed" hayfork variety, the square sides extending back to within a foot of the small wheel, the seat being supported on a cross-bar provided for the purpose. At the corners of the frame are strong adjustable hinge joints; the saddle bridge, as well as the pedal shaft, stays the machine when in running order. When the machine is required to be folded the pedal shaft readily detaches, and the saddle bridge, hinged by light
tie rods to the cross-piece of the frame, lifts up and allows the large wheels to be folded round the small one, and itself is thrown back and rests upon the wheels. By this arrangement the machine can be reduced from 39 in . in breadth to 22 in ., and is moreover at the same time reduced 22 in . in length. The machine runs straight, and stands independently when folded.

The Dalby Adjustable Handles. - In these the handle-rod is square, and inserted in it lengthways is a wedge-shaped tongue of iron, which can be raised by a knob or handle inside the steering handle. The handle-rod is notched or drilled at intervals. Into the notches or holes are fitted spring catches, which securely hold the handle in position. When it is required to alter the adjustment the knob is drawn up by the finger; the wedge-shaped tongue presses back the spring catches, and the handle-rod is free to be raised or lowered to the desired position. When this is done the knob is released, and all is secure again. All this can be effected with great rapidity and whilst the machine is running.

The Premier Sociable Steering Gear is arranged so that the male rider, who usually has command of the machine, may be able to sit on the right-hand side without inconvenience. The steering rod is carried from the arm of the steering wheel straight back to the centre of the machine as usual. Here it is hinged to the end of an arm, which is jointed centrally beneath the right-hand rider's seat, the other end being hinged to the end of a short rack-rod actuated in the usual way by the pinion on the steering handle.

The Dalby Lever Gear makes use of both the hands and feet. The machine has a double-cranked cross axle, beneath and behind which two fulcrum rods or rocking shafts are held by centres at their ends. To these are attached long pedal levers, which are connected by connecting rods with the cranked axle. Each pedal lever is attached to a separate rocking shaft, and near to the end of each shaft, on the opposite side of the machine to the lever, is pinned or keyed a short arm or claw, which carries at its extremity a sort of segment or link. Close to this is a hand lever, which plays loosely on the rocking shaft. At its other end is attached by means of a universal joint, a rod, which at its top end carries the handle, which serves the double purpose of pulling and steering handle. The steering rack moves up and down with the hand lever, and by giving it the same common centre answers as well as if it were mounted on a fixed bracket. It will be evident, from the foregoing description, that the pedal lever and the claw being both pinned to the same shaft must move together up or down, as the case may be. Thus, whilst the right foot is pressing down its pedal the left hand is lowering its lever. The size of the segment or link at the end of the claw is carefully adjusted to enable the hand levers to remain at rest when not required to augment the power of the feet, the claw playing up and down with the motion of the pedal lever, but without touching the hand lever. When the rider needs the hand gearing he pulls at the handle and the lever transmits the power to the top end of the
segment and thence along the rocking shaft to the pedal lever, which pushes upwards at the crank. This arrangement enables the right hand to pull against the right foot, and the left hand against the left foot.
The Monarch Stirrup Pedals are described on page 68. The accompanying illustration shows the action of the foot when using them.


THE MONARCH STIRRUP PEDAL.
The Monarch Clutch or Ratchet Gear consists of an ordinary ratchet and pawl in principle, but three pawls are used, so arranged as to bite at every $\frac{1}{3}$ of a tooth, or allow only $\frac{1}{48}$ th of a revolution without a bite. The accompanying illustration shows the arrangement.


THE MONARCH CLUTCH.
The New Merlin Clutch consists of a metal drum or disc, the sides of which are cut with grooves tapering one way. Into these recesses or grooves balls are fitted, and on moving the discs by means of gut straps, in a forward direction, the balis run into the thin portions of the recesses, and jamming against the sides of the enclosing box attached to the wheel axle, draw it round and effect propulsion, running back into the circular hollows of the grooves on pressure being removed.

The Englefield Driving Clutches are on the principle of an eccentric, a ball being placed in the space between a round axle and an eccentrically hollowed driving disc, the action of propelling which either way forcing the ball into the narrower regions of the recess, and causing it to jam the two together and drive both round.

The Alaska Balance Gear is enclosed in a box. The outer box forms the chain-wheel and pulley for brake. Inside the box are two conical toothed wheels, and on the axle-shaft is a spur wheel which gears into one of the small conical wheels. On the inside flange of hub is a corresponding set of teeth which communicate with the other conical toothed wheel. The smaller of these conical wheels gears into the spur wheel keyed on the axle. The larger one gears into the teeth on the hub. When driving along level roads all wheels lock together, and therefore both wheels drive. When steering round corners the two simall conical wheels give way to each other, and the outside wheel goes more quickly hy the compensation allowed in the two conical wheels, one giving way to the other.

The New Merlin Change-speed Gear consists in jointing the end carrying the pedal a couple of inches from its extremity in such a way that by kicking it back with the foot the pedal is brought four inches nearer the driving cord attachment for speed, and as much farther from it for power, an increase or decrease of 25 per cent. in the leverage, either way, being the result.

The Leader Adjustable Seat and Brake combined.-In this the seat-rod has a worm cut upon it. and is worked as described on page $5^{2}$. The rods carrying the spoons of a double tyre brake are attached to the seat, and by lowering this on a steep hill the brake spoons are brought down on to the rear portion of the tyres, the weight of the rider keeping them very firmly applied.

## ALASKA FRONT STEERER-D.D.

English Cycle Co., Cradley Heath, Wolverhampton. Leading Features. Front steering. Double driving with balance gear. Description. Two 46 in . and one 18 in . wheel. Driving wheels $46 \mathrm{in} .$, running level. $\frac{7}{8}$ in. rubbers. Crescent rims. 50 and 20 direct spokes. G.M. hubs, 5 in. $\times 3 \frac{1}{2}$ in. Ball bearings to all wheels, and plain to crank shaft. Stanley rudder head. Rack and pinion steering. Spade handles. Double-cranked pedal shaft. $5 \frac{1}{2} \mathrm{in}$. throw. Rubber pedals, plain. Chain driving, and Alaska double driving gear. Push lever band (4 $\frac{2}{2} \mathrm{in}$. x $1 \frac{3}{4} \mathrm{in}$.) brake. Adjustable $\Gamma$ seat rod. Elliptical spring. Pan seat. Footrests on frame. Adjustable wrench. Valise. Oilcan. Lamps. Bell. Width 36in. Weight 85lbs. Loop frame.
Specialties. Driving gear (addenda).
Price .. .. .. .. £18 0s. 0d. Sent out with plated fittings, rest painted in two colours.
Remarks. I have not yet seen this machine, so do not know what special features it possesses. It has only just been introduced. The gearing used is described in another column.

AURORA.-(For description see page 136.)


EUROPA.-(For description see page 181.)


HOWE FRONT STEERER.-(For description see page 199.)


THE HOWE FRONT STEERER.

## KRAO.

J. Harrington \& Co., Enamel Works, Much Park Street, Coventry.

Although a machine this is not a machine-if I may be allowed to say soas it is not complete in itself. It is an attachment to any ordinary frontsteering tricycle, and consists of a 30 in . wheel with $\frac{7}{8} \mathrm{in}$. rubber, crescent rims, Arab spokes, \&c., \&c., mounted in a sort of fork which ends in a pair of very long centres working in a head, which fastens by clips and cross bolts to the cross tube of a single tricycle. A pair of cranks with chain wheel are attached to bearings, and the wheel is geared to run as a 52 in ., a support for an Arab cradle spring and saddle being placed above the wheel. It costs $£ 710$ s., and is enamelled all over. By this means any front steering tricycle can be quickly converted into a tandem-style sociable, a male rider, of course, occupying the Krao portion. (See Advertisement.)

L E D A -(For description see page 208.)


tHe minotaur.

## PASSETOUT.

This machine is about the "latest out," in fact it isn't out yet, not being commercially on the market, and barely over the experimental stage. In consequence I do not go into its details of construction, but will confine myself to generalities and description of its peculiarities. In general contour it resembles an open-fronted rear-steerer, but its leading feature is, that in place of steering with the back wheel it does so with both the front ones. To effect this their uxles are attached to the frame by strong rocking joints, and to each an arm is attached, connected by short joints or rods, with a swivelling lever, i.e., an equal armed lever, with its fulcrum in the centre. An arm is set at right angles to this swivelling lever, and is worked to and fro by a screw in connection with the steering handle. The moving of this draws one of the ends of the swivelling lever forwards and the other backwards, thus causing the two front wheels to both turn in the same direction, and describe arcs of concentric circles. The next feature of the machine is the driving gear. This is on the lever principle, and a double lever is used, working on a common fulcrum, one carrying the pedal, the other and shorter arm having a curved bar at its end, to the lower extremity of which a band or cord is attached and drawn down by the pressure of the foot. The other end of this band passes round a drum which runs loosely on the boss of the wheel, and has on its outer face a set of ratchet teeth, whilst the inner face of the hub flange has ratchet teeth all round. The driving disc works in connection with a jig or guide which causes it to move downwards in one plane and return in another, thus engaging its ratchet teeth with those on the driving wheel in the forward stroke,
and freeing itself in going back. The machine is thus an alternate driver, or both wheels can be driven together if need be. The third novel feature consists in suspending the fore ends of the frame upon strong springs, so as to avoid vibration as much as possible.

## SPARKBROOK NATIONAL SOCIABLE-D.D.

Sparkbrook Manufacturing Co., Ld., Much Park Street, Coventry.

Leading Features. Front steering. Double driving with two chains and balance gear.
Description. Two 50 in . and one 22 in . wheel. Driving wheels 50in., running level. lin. and $\frac{7}{8} \mathrm{in}$. rubbers. Crescent rims. 60 No. 11, and 20 No. 12 direct spokes. G.M. hubs, 6 in . x $4 \frac{1}{2} \mathrm{in}$. Relus ball bearings to steering wheel, universal jointed plain to driving axle and crank shafts. Rack and pinion steering. Adjustable spade handles. Double-cranked pedal shafts, $5 \frac{1}{2}$ in. throw. Fourbar, non-slipping rubber ball pedals. Two chains, and National differential azle. Grip brake, with fly nut on steering side ; lever on other, with 6 in. $\frac{1}{8} \mathrm{in}$. band. Arab Cradle springs. Adjustable $\Gamma$ seat rods. Pan seat and Longdistance saddle. Long hinged rubb-r-clothed footrests on frame. Set of spanners. Oilcan. Weight 145lbs. Width 63in. The frame is a double loop of weldless steel tube.

Specialties. General construction. Universal jointed bearings. National differential axle (page 84). Harrington's enamel.

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\text { Price .. .. .. } \quad £ 30 \text { 0s. } 0 \text { od. }
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## Sent out enamelled in Harrington's Enamel.

Remarks. This is one of the finest sociables on the market. Fitted with central balance gear it has two chains, so that the power of both riders is transmitted to the central gear, and any theoretical twist of axle avoided. The crank-shafts may be set either in front or behind the frame by the riders at will, and thus the position rendered vertical or thrusting as desired. (See Advertisement.)

## SPECIAL SHIRLEY-D.D.

## A. Rumsey \& Co., 22, Shirley Street, Southampton.

Leading Features. Front steering. Double driving with ratchet gear. Central gear.

Description. Two 48in. and one 18 in . wheel. Driving wheels 48 in ., running as 44 in . 7 in . and $\frac{3}{4} \mathrm{in}$. rubbers. Crescent rims. 52 and 20 , No. 11 direct spokes. G.M. hubs, 6in. x 3in. Ball bearings throughout. Rack and pinion steering. Adjustable spade handles. Bicycle cranks, 6in. throw. Rubber pedals. Central chain gear, and ratchet double driving gear. Lever double band ( $6 \mathrm{in} . \times 5 \mathrm{in}$.) brake. Elliptical spring. Adjustable seat rod. Suspension saddle. Footrests on frame. Oilcan. Spanner. Weight 85lbs. Width 39 in . $T$ frame.
Price .. .. .. .. £21 10s. 0d.

Sent out with plated fittings, rest painted in two colours.
Remarks. This is only just introduced, and I have not seen it yet.
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[^4]:    The above list comprises all known clubs admitting tricyclists only, with the number of members when last
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